

SCIENCE.

FRIDAY, NOVEMBER 23, 1883.

THE NOVEMBER MEETING OF THE NATIONAL ACADEMY OF SCIENCES.

For the first time in nineteen years, and the second time in its history, the National academy held its mid-year meeting in New Haven, Nov. 13-16. Thirty-three of the ninety-three members were in attendance, and during its four days' session twenty papers were presented.

The meeting was conspicuous for the discussion which most of the papers called forth, and for the general participation of the members in these discussions. It was interesting, also, for the report of the committee on the solar eclipse of last May, which included the detailed reports of the expedition to Caroline Island by the principal participants, Professors Holden and Hastings. It will further be remembered by the members from other cities for the marked hospitalities they received at the hands of their confreres of New Haven, and for its many social pleasures, culminating in the brilliant public reception given them by the president, Professor Marsh, at his residence. The new buildings recently finished, or in process of erection, for the furtherance of scientific research and instruction in Yale college, were also examined with interest, together with the treasures of the Peabody museum, where the finely mounted collections of Professors Verrill and E. S. Dana, and the fossil vertebrates of Professor Marsh, called forth much admiration.

The generous discussion to which the papers gave rise was provoked at the very start by the paper of Dr. Graham Bell upon the formation of a deaf variety of the human race, which had a broad, practical interest, and which consumed the entire morning session of the first day. Mr. Bell claimed, that, from purely philanthropic motives, we were pursuing a method in the education of 'deaf-mutes' distinctly tend-

ing to such a result, supporting his assertions by statistics drawn from the published reports of the different institutions in this country devoted to the care of these unfortunates. They are separated in childhood from association with hearing-children, and taught what is practically a foreign language, — a practice which isolates them from the rest of the community throughout their lives, and encourages their intermarriage. Such marriages were increasing at an alarming ratio, and with calamitous results. As a remedy for this danger, Dr. Bell would have the children educated in the public schools, thus bringing them into contact with hearing-children in their play, and in instruction wherever they would not be placed at a disadvantage, as in drawing and blackboard exercises. He would also entirely discard the sign-language, and cultivate the use of the vocal organs, and the reading of the lips.

The report on the solar eclipse covered a variety of topics, and will fill some hundred and fifty printed pages. In presenting it, Prof. E. S. Holden merely touched upon the principal points, and gave the leading results, in much the same form as they have already been given in this journal. The objects of the expedition were successfully carried out; and Professor Holden regarded his special work — the search for a possible planet interior to Mercury — as proving the non-existence of the small planets reported by Professors Watson and Swift.

Dr. C. S. Hastings read in full the greater portion of his report upon the spectroscopic work, which concluded with a critical review of the generally received theories of the solar atmosphere, and suggested, instead, that the corona was a subjective phenomenon, largely due to the diffraction of light.

The presentation of these reports occupied the entire morning session of Wednesday, and their discussion the greater part of the afternoon session.

In criticising the current use of the word 'light' in physics, Professor Newcomb opened a long and interesting discussion. He urged that photometric measurements were comparatively valueless, because they estimate a part only of the radiant energy of the sun; whereas the quantity which should be determined was the number of ergs received per square centimetre. Professor Langley, however, asserted that it would be impossible to estimate the radiant energy received from the stars with our present appliances: not all the stars combined would produce deflection, even in so sensitive an apparatus as the bolometer.

Another feature of marked interest was Professor Rowland's exhibition of photographs of the solar spectrum, obtained by his new concave gratings, by which he had prepared a map of the spectrum much more detailed than heretofore secured, and free from the defects of scale found in previous photographs.

Professor Asaph Hall communicated the results of his researches upon the mass of Saturn, based upon new measurements of the distances of the outer satellites. He determines the relative mass of the sun to that of Saturn to be as 1 to $\frac{1}{3482}$.

Professor Brewer took the occasion of the academy's meeting in the city of his residence to exhibit samples of his experiments of many years' duration upon the subsidence of particles in liquids. They showed the action of saline and organic matter, of acids and of freezing, upon the precipitation of sediments. Most of the samples had been undisturbed for five or six years, and showed varying degrees of opalescence, resulting from the suspension of matter in the fluid.

We have mentioned only the more important papers, or those which provoked a fuller discussion than usual. The following complete list will show how largely the physical side of science predominated at the meeting. In *astronomy*, besides the reports on the eclipse of May 6, papers were read by A. Hall, on the mass of Saturn; by S. P. Langley, on atmospheric absorption; and by O. T. Sherman (present by invitation), on personality in the

measures of the diameter of Venus: in *mathematics*, by S. Newcomb, on the theory of errors of observation, and probable results: in *physics*, by S. Newcomb, on the use of the word 'light'; by W. H. Brewer, on the subsidence of particles in liquids; and by H. A. Rowland, on a new photograph of the solar spectrum: in *meteorology*, by E. Loomis, on the reduction of barometric observations to sea-level: in *geology*, by T. S. Hunt, on the Animikie rocks of Lake Superior; by J. D. Dana, on the stratified drift of the New-Haven region; by B. Silliman, on the mineralogy and lithology of the Bodie mining-district; and by J. S. Newberry, on the ancient glaciation of North America: in *chemistry*, by W. Gibbs, on phospho-vanadates, arsenio-vanadates, and antimonio-vanadates, and on the existence of new acids of phosphorus: in *physiological chemistry*, by R. H. Chittenden (present by invitation), on new primary cleavage forms of albuminous matter: in *paleontology*, by J. Hall, on the Pectenidae and Aviculidae of the Devonian system; and by O. C. Marsh, on the affinities of the dinosaurian reptiles: in *anthropology*, by A. G. Bell, on the formation of a deaf variety of the human race; and by J. W. Powell, on marriage institutions in tribal society.

The report of the committee on glucose, appointed by the president in conformity with a request from the government, was accepted by the academy, and will be transmitted to Congress with the president's report. This will also embody the proceedings of recent meetings of the academy, the report of the committee on alcohol, and that on the eclipse of the sun, together with the thanks of the academy to the secretary of the navy and the officers of the Hartford for their co-operation in the expedition to Caroline Island. It will also include an expression of the approval of the academy of the efforts now making to secure a system of uniform time.

The next stated session of the academy will be held in Washington in April next, and it is probable that the following mid-year session will be held in Cambridge.

THE WEATHER IN SEPTEMBER.

THE weather-review of the U. S. signal-service shows that in September there were two peculiar features, — the low mean temperature, and the deficiency in rainfall. The former was characteristic of all districts east of the Rocky Mountains, though the temperature was above the normal on the Pacific coast. The greatest deficiency in rainfall was in the east Gulf states, but the drought has been severe in various sections. Forest-fires burned over large tracts of land, causing the destruction of much property, especially in New England.

The accompanying chart exhibits the mean pressure, temperature, and wind-directions for the month, and needs no special comment. Nine barometric depressions were observed within the limits of the country, the average course being farther north than is usual. Of these, one was especially severe on the Lakes and in Canada, and one was a well-developed tropical hurricane. The latter was first observed near Martinique, on the 4th: it was very violent in the Caribbean Sea, and caused great destruction in the Bahamas, the loss of life being over fifty. It reached the North Carolina coast on the 11th, and was a destructive gale between Cape Hatteras and Wilmington, but lost its energy on reaching the land, and was wholly dissipated. While the damage from the hurricane was great, good service to commerce was rendered by the frequent warnings issued by the signal-service. The depression which existed on the 21st is worthy of note on account of its unusual track. It moved from Milwaukee, north-west to St. Paul, thence southward over Iowa and Missouri, and was the means of considerably modifying the effect of a cold wave which threatened extensive damage by frost. Five storm-centres are traced on the Atlantic, one of which is a continuation of the second of the August hurricanes described in SCIENCE, No. 37, and which passed over Great Britain. Four vessels only report passing icebergs.

With the approach of fall, frequent frosts are reported, and a frost-chart is a special feature of the review: it gives the limits of the regions in which frosts were experienced in connection with the three leading cold waves of the month. In contrast with this, maximum temperatures of 100° or higher were noted in Arizona, California, Idaho, Kansas, Louisiana, Nevada, Texas, and Utah; the highest being 122°.

The extent of the deficiency in the rainfall

is indicated by the following precipitation table: —

Average precipitation for September, 1883.

Districts.	Average for September. Signal-service observa- tions.		Comparison of September, 1883, with the average for several years.
	For several years.	For 1883.	
	Inches.	Inches.	Inches.
New England	3.74	2.50	1.24 deficiency.
Middle Atlantic states . .	4.14	4.47	0.33 excess.
South Atlantic states . .	5.94	6.63	0.69 excess.
Florida peninsula	6.76	5.07	1.69 deficiency.
Eastern gulf	4.98	1.05	3.93 deficiency.
Western gulf	4.33	3.17	1.16 deficiency.
Rio Grande valley	4.54	6.31	1.77 excess.
Tennessee	3.48	2.29	1.19 deficiency.
Ohio valley	2.49	1.53	0.96 deficiency.
Lower lakes	3.03	2.82	0.21 deficiency.
Upper lakes	3.98	2.78	1.20 deficiency.
Extreme north-west . . .	2.24	1.01	1.23 deficiency.
Upper Mississippi valley .	3.45	1.67	1.78 deficiency.
Missouri valley	2.60	2.60	Normal.
Northern slope	1.26	0.89	0.37 deficiency.
Middle slope	1.59	3.02	1.43 excess.
Northern plateau	0.78	0.06	0.72 deficiency.
Southern plateau	1.22	0.57	0.65 deficiency.
North Pacific coast . . .	2.13	1.18	0.95 deficiency.
Middle Pacific coast . . .	0.21	0.48	0.27 excess.
South Pacific coast . . .	0.03	0.04	0.01 excess.

The drought in the southern states is a continuation of that of former months, as is shown by the following table of deficiencies in the districts named: —

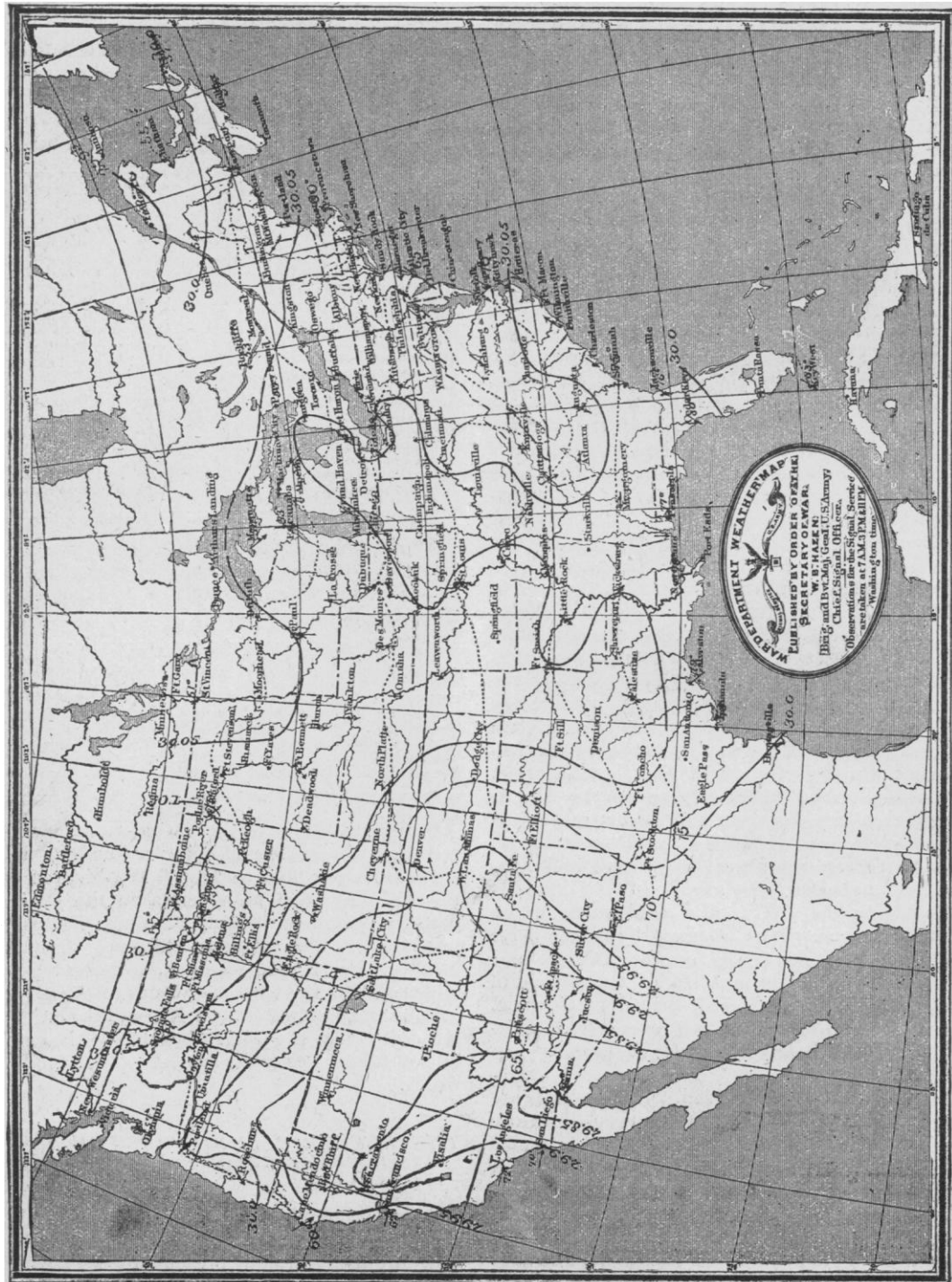
Districts.	July.	August.	September.	Total.
	Inches.	Inches.	Inches.	Inches.
Tennessee	—0.99	—0.41	—1.19	—2.59
South Atlantic	—0.73	—0.72	+0.69	—0.76
Eastern gulf	—2.54	—1.94	—3.93	—8.41
Western gulf	—1.72	—2.65	—1.16	—5.53

Several instances of great wind-velocity were recorded, the maximum being a hundred and eight miles per hour at Mount Washington on the 9th. At Cape Mendocino, on the Pacific coast, a maximum velocity of ninety-six miles was noted. The singular fact, not unusual, however, in the winter season, is deserving of mention, that the total movement of the air at Delaware Breakwater and Kittyhawk, on the Atlantic coast, is greater than that at the summit of Pike's Peak, the loftiest station in the world.

THE ELECTRIC LIGHT ON THE U. S. FISH-COMMISSION STEAMER ALBATROSS.¹—II.

As superintendent of the building of the ship, my expectation was, that numerous and intricate problems would present themselves in running the wires about the iron hull, through

¹ Continued from No. 41.



MONTHLY MEAN ISOBARS, ISOTHERMS, AND WIND-DIRECTIONS, SEPTEMBER, 1883. REPRINTED IN REDUCED FORM BY PERMISSION OF THE CHIEF SIGNAL-OFFICER.

iron bulkheads and beams, close to the boilers or hot steam-pipes, and through damp places.

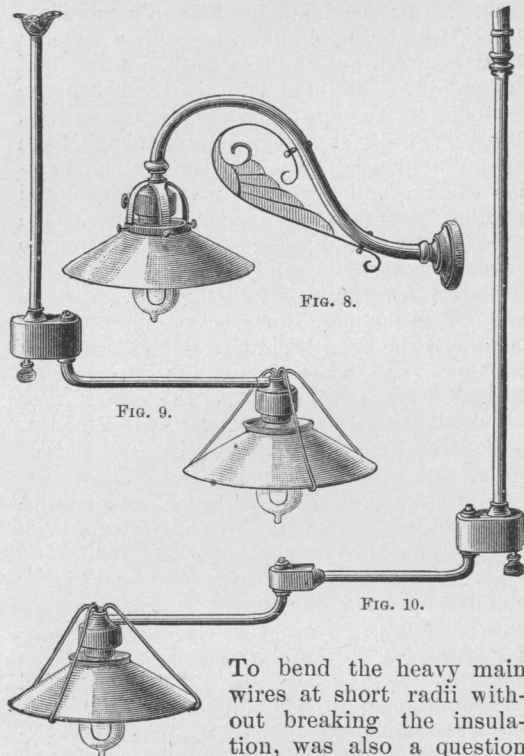


FIG. 8.

FIG. 9.

FIG. 10.

To bend the heavy main wires at short radii without breaking the insulation, was also a question that presented itself. But

all these had been apprehended. Where the wires passed damp places, they were incased in rubber tubes, besides their insulation of cotton-cloth and white lead; in all hot places they were incased in lead pipe; where they passed through iron bulk-heads or beams, ferrules of hard rubber or gutta-percha were used; and the mains, instead of being single wires of large size, were composed of a number of smaller wires, which, of course, made them more flexible. Where the wires passed an iron surface, such as a lodger-plate or stringer, they were fitted to a groove in a wooden batten; and, where they

passed a wooden surface, they were embedded into a groove cut in the wood; and, when carefully painted over, it is difficult to detect their presence. The main wires, as far as possible, were led behind the wooden lining of the ship. Where the wires were spliced or 'tapped,' their insulation was removed, and the naked metallic surfaces brightened with sand-paper, to insure metallic contact. They were then twisted together tightly, and soldered. The naked place was then covered with insulation-tape, which is common cotton tape saturated with a bituminous insulation compound manufactured by the Edison company, the components of which are kept a profound secret, and which an irreverent young man has named 'gulloot.'

The lamp-fixtures are designed to suspend the shade above, and to cast the unobstructed rays of the light downward. Handsome brass fixtures of three kinds, with porcelain shades, are used on board. Fig. 8 is called a bracket, and figs. 9 and 10 are single and double swing-brackets respectively.

The wires are run through the tubes of these brackets; but in the joints of the swing-brackets the current is transmitted through insulated hinges, to which the wires are fixed by binding-screws, as shown at *a* in fig. 11, by which arrangement the wires are not twisted in swinging the bracket.

The wires are brought to the binding-posts in the lamp-socket, fig. 12, between their binding-posts and brass conductors. One of these brass conductors is soldered to the thin spun brass socket into

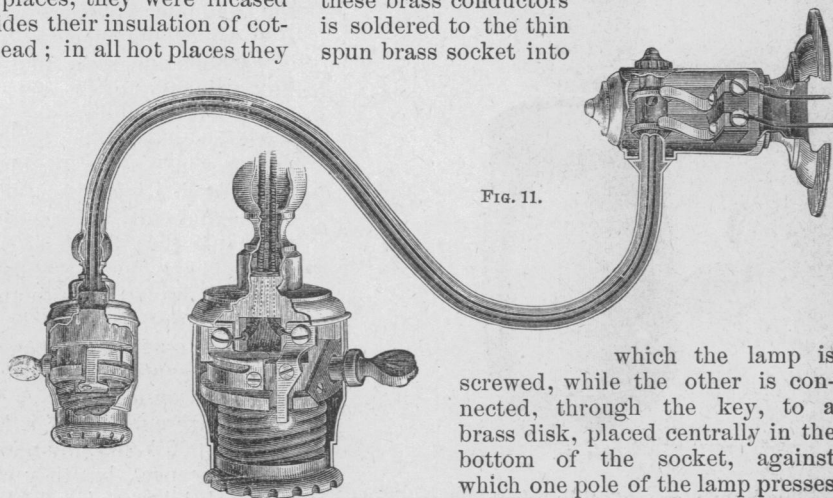


FIG. 11.

FIG. 12.

which the lamp is screwed, while the other is connected, through the key, to a brass disk, placed centrally in the bottom of the socket, against which one pole of the lamp presses when screwed in place. The key

is mounted on a screw-thread of such pitch that one-fourth of a convolution will give it sufficient axial motion to open and close

the circuit. The small number of parts used in these fixtures, their correct proportions, the adaptation of their forms to machine-tool manufacture, and their beauty of design, excite the admiration of the mechanic and the artist.

FIG. 13.

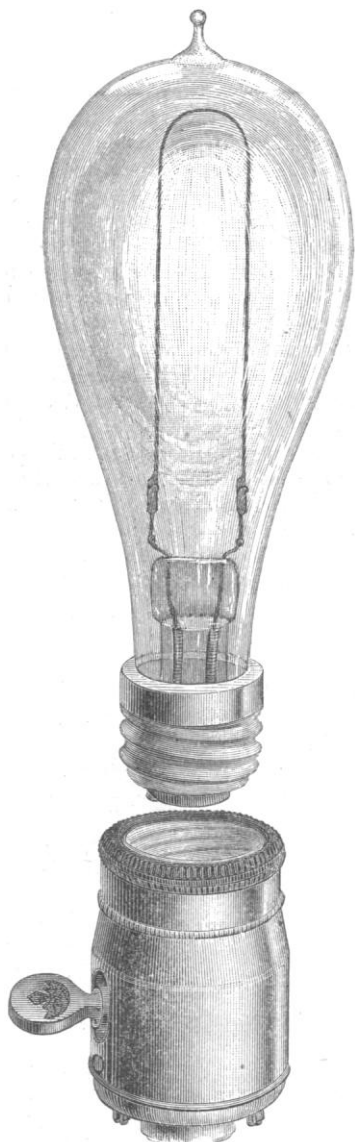


FIG. 14.

The lamps are of thin glass, pear-shaped, containing a thread of bamboo carbon about the thickness of a horse-hair. The small end of the lamp contains glass of sufficient thickness (fig. 13) to make a tight joint on the

platinum-wire conductors which carry the current to the carbon. The atmosphere is exhausted from the lamp by Edison's modification of the Sprengel pump, through a tube at the upper end, and the tube is then fused and broken off. Platinum wire is used because its index of expansion is the same as glass, thus preventing any leakage or breakage from unequal expansion from the heat. The bamboo carbon and platinum wire are soldered together by electrically deposited copper. One wire, passing through the glass, is soldered to a small brass disk, which is centred on the bottom of the lamp, while the other wire is soldered to the spun brass screw-thread which surrounds the cylindrical part of the bottom of the lamp; and, when the lamp is screwed into the socket (figs. 14 and 12), the circuit may be completed or broken by the switch or key already described. When the circuit is closed, the carbon thread becomes heated, from its high resistance, to incandescence, and continues to glow, in vacuum, without burning, so long as the current continues to flow. The wires having a larger sectional area and higher conductivity carry the current without perceptibly warming. By varying the length or sectional area of the carbon thread, keeping the electromotive force constant, Edison has varied the candle-power of his lamps.

For example: let the electrical resistance be represented by R , the sectional area of the wire or carbon by S , the length by L , and the constant, dependent on the material of which the conductor is made, by a ; then $SR = aL$, from which simple equation the relative sizes of carbons and wires may be determined, and proportioned to the tension in the circuit. Mr. Edison employs a number of different-sized dynamos, which he designates by letters; but he winds them for but two tensions, i.e., the A and B circuits. The A lamp belongs to the A circuit, as its carbon thread is of such resistance that the B circuit would heat it to only a cherry red. A B lamp, however, in the A circuit, would acquire an intense brightness, but its duration would be very limited. Two B lamps in series, in the A circuit, would, by their augmented resistance, glow at about their normal incandescence.

The average life of a lamp is said to be about 1,000 hours, when kept up to its normal incandescence; but they will last much longer if their brightness is a little suppressed. This may be effected either by throwing in resistance, or by slowing the engine. On board ship, however, about as many lamps are broken by accident as from natural deterioration.

The cost of the lamps is one dollar each ; and, at the present rate of consumption from all causes, the annual expenditure will be 56 lamps. The dynamo is run about 2,190 hours per year (about six hours per day), with an average of about $47\frac{1}{2}$ lamps in circuit, so that the annual lamp-hours would be about 104,025 (2190×47.5). Thus it appears that our lamps will, at present consumption, last us in the neighborhood of 1,857 ($\frac{104,025}{56}$) hours each.

Description of lamps.

Designation of lamps.	Candle-power.	Resistance in ohms.	Current in amperes.	Electromotive force in volts.
A	32	86	1.180	102
A	16	137	0.745	102
A	10	250	0.400	102
B	8	69	0.745	51
B	16	42	1.200	51

In event of a short circuit through a good conductor, between the wires there would be instantly generated heat of such intensity that the wires would melt, and perhaps the armature also. This heat would in all probability set fire to the wood-work along the line of the wire. To prevent this, Edison has devised his cut-out block, or safety-catch, — a neat device for placing a short piece of alloy in the circuit, which, at 400° F., will melt, and open the cir-

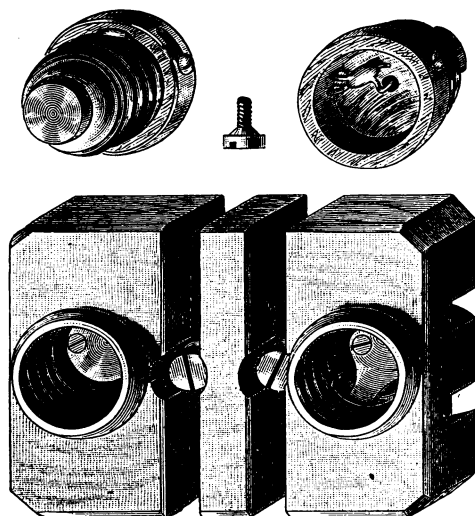


FIG. 15.

cuit. When this happens, all the lamps on the branch circuit fed through that cut-out will be immediately extinguished ; and, though one is left in darkness at that point, he is re-

warded by a consciousness of greater mischief having been prevented. Fig. 15 represents a double pole cut-out block, a front and back view of the cut-out plug, and a binding-screw. Fig. 16 shows a back view of the same cut-out block, and a section through a cut-out plug. The fusible alloy is contained in the plug, and

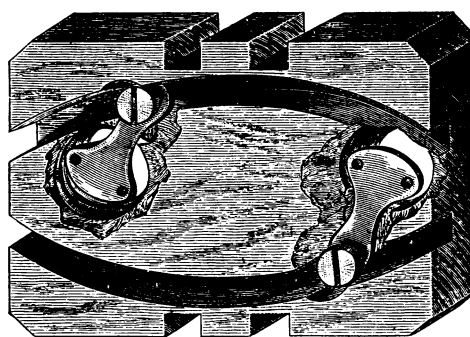
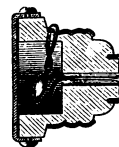


FIG. 16.

is utilized as a solder to unite the two poles of the plug. The plug is made similar to the bottom of a lamp, and the block-socket is similar to a lamp-socket. The wires are held by the binding-screws, and the current passes through the metal of the block and plug. These cut-outs are placed on each of the main circuits, near the dynamo, and on each branch circuit, and always in convenient positions. The alloy in the plug is the only part destroyed by a short circuit, and it is only a minute's work to substitute a new plug.

(To be continued.)

REPORT OF THE GERMAN CHOLERA COMMISSION.¹

WHEN the commission arrived in Egypt, the cholera epidemic had already begun to decline, so that we could not expect to obtain all the material necessary for carrying out our examinations. Besides, since the termination of an epidemic is the least suitable time for etiological researches, our original plan was to make such preliminary studies as we could in Egypt, and then check our results, as soon as the epidemic had reached Syria, by further investiga-

¹ Report to Minister von Bütticher, secretary of state for the interior. By Dr. Koch. From the *Kölnische Zeitung* of Oct. 17.

tions in suitable localities in that country. We were able to carry out the first part of our plan in accordance with our wishes; for the commission found abundant opportunity, during its stay in Alexandria, to collect the material necessary for its preliminary researches. This was mainly due to the active co-operation of the physicians of the Greek hospital, who furnished us working-rooms, permitted us to study the cholera cases in the hospital, and placed the bodies of those who died of the disease at our disposal.

At first the commission had two rooms of the hospital, adjoining each other on the ground-floor, and well lighted. In one room the microscope work was carried on, and in the other the culture experiments. The animals experimented on were at first brought into both rooms. But when their number had been increased, it was thought too dangerous to manipulate the material for infection in the same rooms in which we had to spend nearly the entire day, and they were accordingly removed to another room in the old hospital; and there the experiments on infection were made.

The material for experiment was obtained from twelve cholera patients, and ten bodies of individuals who had died of the disease. The cases of nine of the patients were studied in the Greek hospital, two in the German, and one in the Arabian. The symptoms corresponded in all cases with those of true Asiatic cholera. Specimens of the blood, of the vomited matter, and of the dejections of these patients, were taken; and submitted to examination. It was soon apparent that the blood was free from micro-organisms, that the vomited matters were comparatively poor in them, but that the dejections contained a considerable quantity; and the latter material was therefore mainly used in the infection experiments with animals.

Although the number of bodies used for dissection was small, the material they afforded was of the greatest service in localizing the disease. They represented the most varied nationalities (three Nubians, two German-Austrians, four Greeks, and one Turk), were of different ages (two were children, two over sixty years of age, and the others between twenty and thirty-five years), and the duration of the disease varied in the different cases. The most important fact, however, is that dissection could be begun immediately or in a few hours after death. The changes produced in the organs, and especially in the intestines, by putrefactive decomposition shortly after death, which render microscopical examination difficult, and its results generally entirely deceptive, were thus effectively guarded against. I wish to lay particular stress on this circumstance, because it is hardly probable that such excellent material for microscopic examination as we obtained could be found in other places.

The appearances of the bodies, as well as the symptoms of the sick, left no room for doubt that we had to deal with true cholera, and not, as at first supposed, with diseases resembling cholera, — the so-called 'cholericform' and 'choleroïd' diseases.

We were unable to detect any organized infectious

matter in the blood, or in the organs which are usually the seat of micro-parasites in other infectious diseases; viz., the lungs, spleen, kidneys, and liver. Occasionally bacteria were found in the lungs; but it was clear from their forms and position that they had nothing to do with the processes of the disease, but had entered the lungs from the vomited matter by aspiration. In the contents of the intestines, just as in the choleraic dejections, there was an extraordinarily large number of micro-organisms of different kinds, no one of which was present in excessive proportion. There were also no special indications which could enable us to draw any conclusions as to their connection with the disease. On the other hand, the examination of the intestine itself gave a very important result. In all cases but one, a specific form of bacteria was found in the walls of the intestine. The exception was in the case of a patient who had died of a *sequela* several weeks after the cholera had subsided. These bacteria were rod-shaped, and therefore belong to the bacilli. In size and shape they most nearly resemble the bacilli of glanders. In cases where the intestine showed the slightest evidence of change, the bacilli had penetrated into the tubular glands of the mucous coat, and had set up a considerable irritation there, as was shown by the distension of the glands, and the accumulation of many-nucleated round cells in their interior. In many cases, too, the bacilli had worked their way beneath the epithelium, and had penetrated between it and the gland membrane. Moreover, they had planted themselves in large quantities over the surface of the villous coat of the intestine, and had penetrated its tissue. In severe cases of the disease, where there was a bloody infiltration of the mucous coat of the intestine, the bacilli were present in great numbers, and had not confined themselves to the invasion of the tubular glands, but had entered the surrounding tissue in the deeper layers of the mucous coat, and sometimes had penetrated to the muscular coat. The villous coat was also thickly covered with them in such cases. The principal seat of all these changes was found to be the lower part of the small intestine. In investigations like the present, the examination ought to be made on perfectly fresh bodies, because putrefactive decomposition can induce similar growths of bacteria in the intestine. From this consideration I was unable last year to attach any value to the discovery of the same bacilli in the same position in the intestines of cholera patients which I had obtained directly from India, because I was afraid of complications with *post-mortem* changes. This former discovery, which was made in the intestines from four bodies of persons who had died of cholera in India, is now confirmed, because there can be no error in the present case due to decomposition in the Egyptian bodies. The inference, too, that the correspondence in the conditions of the intestine in the Indian and Egyptian cholera may be taken as a further indication of the identity of the diseases, is not without weight.

The number of bodies of cholera patients used by the commission for examination, it is true, was small.

Bacilli were found in all the fresh cholera cases, but were wanting in the case where death had occurred after the symptoms of cholera had disappeared, and in others where death had not occurred from cholera, in which examinations were made for the sake of comparison; so that there can be no doubt that these organisms have some connection with that disease. But it is too much to conclude yet that bacilli are the cause of cholera because they are found in the mucous coat of the intestine of cholera patients. The inference might be reversed; and we might say that the disease produces such changes in the mucous coat, that some of the many bacteria present there as parasites are able to penetrate the tissue. A decision of the question, which of the two views is correct, — whether the infection or the bacteria invasion comes first, — can only be settled experimentally by collecting the bacteria from the diseased tissue, breeding them by 'pure culture,' and then reproducing the disease by infection experiments on animals. For this purpose it is necessary, first of all, to have such animals at our disposal as are susceptible to the infectious matter; but in spite of every effort to infect animals with cholera, it has not yet been demonstrated that they can be made to take that disease. Experiments have been tried with rabbits, guinea-pigs, dogs, cats, monkeys, pigs, rats, etc., but always without success. The only statements to the contrary, worthy of notice in this connection, are the accounts of Thiersch's experiment with mice which he fed with the contents of the intestine of a cholera patient, and which were then attacked with diarrhoea, and died. This experiment has been confirmed by reliable experimenters, like Burdon-Sanderson, and has been criticised, and the conclusions drawn from it disputed by others. We considered it necessary to repeat this experiment because it was of the utmost importance for our purpose to discover some species of animal capable of infection with cholera.

Fearing that the requisite number of mice could not be obtained at once in Alexandria, we carried fifty of those animals with us from Berlin, and began the infection experiments with them. We also experimented with monkeys, — because they are the only animals susceptible to certain human diseases, such as small-pox and relapsing fever, — and, besides these, with a few dogs and chickens. But, in spite of all our care, the experiments were failures. The most varied samples of vomited matter, choleraic dejections, and contents of the intestines from bodies of persons dead of cholera, — sometimes fresh, sometimes after standing some time in a cool or warm place, and sometimes in a dried condition, — were fed to these animals; but no symptoms of cholera appeared, and they remained perfectly healthy.

Besides this, 'pure culture' experiments were made with bacilli taken from the contents of the intestine and its walls. The material obtained in this way was fed to the animals, and inoculation was also tried. This latter method, with the products of the 'pure culture,' sometimes produced septic diseases; but no symptoms of cholera appeared.

That the material of the disease is very often con-

tained in the dejections of cholera patients in an active form, is shown in several ways, and particularly by the frequency of the disease among washerwomen who wash clothes soiled with such dejections. A case in point occurred during the present epidemic in the Greek hospital, where a washerwoman who washed for the cholera hospital exclusively was taken with the disease. It is therefore certain, that, of the numerous samples used in our experiments, some at least must have contained the infectious matter. But since our experiments were failures, it must be assumed, either that the animals we used are not susceptible to cholera, or that we had not discovered the right method of producing infection. At any rate, the experiments ought to be repeated and modified; but, with the material now at our command, there is little prospect that they would prove successful.

Our want of success may possibly be explained in still another way, which is this. In a place visited by the cholera it is usual for the disease to cease before all the inhabitants have been attacked; and, although the infectious material is scattered about in great quantity, fewer and fewer persons are affected by it, and the epidemic at last dies out in the midst of individuals capable of taking it. This circumstance can only be explained on the theory that the infectious matter loses its activity, or at least becomes uncertain in its action, towards the end of the epidemic. If, therefore, human beings become less susceptible to the infection of cholera towards the end of the epidemic than at its outbreak, it can hardly be assumed that the animals used for experiment, of whose susceptibility to infection we know nothing, should differ from them in this respect. And for our experiments we could only obtain material which had been collected towards the end of the epidemic, and which must be presumed to have been more or less inactive. It is of course possible, that under suitable conditions, such as the outbreak of a cholera epidemic, the infection of animals with the disease might be successfully accomplished; and such would be the proper time to determine by experiment whether the bacilli I observed in the mucous coat of the intestine constitute the true cause of cholera.

However far the commission may still be from a complete solution of the problems proposed to it, and although its labors have contributed little which may prove of practical value in combating the cholera, yet, considering the unsatisfactory conditions under which the experiments were made, and the short time the commission was able to devote to them, the results thus far obtained should be regarded as encouraging. The experiments fully answer the original purpose of localizing the disease, and, by ascertaining the constant presence of characteristic micro-organisms, have supplied the first condition for the investigation of infectious diseases, and afforded a determinate object for further research.

From the foregoing statements, it is clear that the commission can accomplish no more in Alexandria

than has already been done. It might be thought that it could pursue its investigations in some other place in Egypt where the cholera prevails, but there are insuperable objections to such a plan. The cholera has disappeared from all the large cities of the country, and only holds its own in the villages of upper Egypt; and an attempt to carry on our experiments in that part of the country would meet with the strong disapproval of the Egyptian government on account of the disagreeable complications in which the condition of affairs there might involve us. Moreover, I have been assured by responsible persons well acquainted with the Egyptians, that it would be impossible to obtain material for dissection in Egyptian villages; and for these reasons I must renounce all hope of following the course of the cholera up the Nile. The disease also, contrary to all expectation, appears to have gained no foothold in Syria. Since the investigations now in progress will occupy only about two weeks, the work will soon have to be temporarily suspended. The commission, however, entertains a strong desire to prosecute its researches further, and satisfy the object for which it was created. It would be a great disappointment if the results it has already reached should prove fruitless from want of further experiments. The only opportunity which is afforded us at present for continuing our researches is in India, where the cholera is still prevalent in several large cities, particularly in Bombay, and is not expected to subside immediately. It is also probable that we could gain access to some hospital there, and repeat the work which proved so valuable in Alexandria. In case, in your excellency's opinion, it should be deemed advisable to continue the researches of the commission, and extend the field of its labors to India, I am ready to continue in charge of its management.

I must also say a few words about the additional labors which the commission has found time to prosecute in connection with its researches on cholera. Egypt is full of parasitic and contagious diseases, and it was not difficult to obtain suitable material for the examinations we wished to make in order to control the results obtained in studying the cholera, and also to settle some general questions bearing on infectious diseases. For example: I dissected the bodies of two persons who had died of dysentery. In one case, where the patient had died of an acute attack, there were parasites in the mucous coat of the intestine which did not belong to the bacteria group, and were unknown. I also dissected the body of an Arab who had died in the Arabian hospital of malignant disease. The disease in this case was probably taken from sheep, which are imported into Egypt from Syria in great numbers, and die of anthrax *en masse*. I was also afforded an opportunity to observe six cases of bilious typhus in the Greek hospital. This disease closely resembles yellow-fever, with which it is often confounded, and presents much interest to the student. Three of these patients died, and were dissected.

Besides this work, repeated examinations were made of the micro-organisms in the air, and the

drinking-water of Alexandria. If time allows, I intend to study the Egyptian ophthalmia.

The labors of the commission, which from their nature were very trying and fatiguing, and for the most part of a disagreeable character, were rendered doubly irksome by the high temperature prevailing in the city. It has been impossible to interrupt the work a single day until now. Nevertheless, the members of the commission are in good health, and have only suffered from some slight complaints, due to a change of climate, which soon disappeared. However, as soon as the condition of the work will allow, I consider it advisable for the commission to rest a few days. I intend, therefore, to go with it to Cairo for a short time, partly for the sake of recreation, and partly in order to visit the principal seat of the cholera in Egypt, and make further observations there.

THE PHYSIOLOGICAL STATION OF PARIS.¹—I.

WE have seen in the last few years all kinds of establishments erected to provide for the new needs of science. Laboratories, although great discoveries have been made in them, have become in certain respects insufficient. In the study of organized bodies, as in that of the physical forces of the earth, one is soon brought to a standstill if he cannot study nature in her own domain.

Special establishments for certain sciences, astronomy for instance, are a necessity; and lately naturalists have perceived the insufficiency of the means placed at their disposal. Maritime stations, gardens for acclimation, experiment stations, agricultural stations, stations for vegetable chemistry or experimental medicine, — all these have responded to the development of certain branches of science.

Physiology, almost the only exception, has been, up to the present time, dependent upon laboratories. These are, in France at least, wretched places, poor and unhealthy, where the investigators are obliged to live in the hope of discovering the properties of the tissues, and the functions of the living organs. There is discovered the action of medicines upon the living organism, of poisons, and the various chemical and physical agents; there, by means of vivisection, or by the use of the proper and delicate instruments, the inner mechanism of the vital functions is analyzed.

This condition of destitution could not continue. It is evident, that with the means at its disposal, within narrow limits, and compelled to operate upon a few lower animals, physiology could not but remain behind the other sciences. In any case, it could not hope to attain its full development: it must abandon, without practical application, the knowledge that it had obtained at the cost of so great efforts.

In the last half-century physiologists have written a large number of works on the nervous and muscular systems. We have learned to distinguish the nerves

¹ By E. J. MAREY of the French institute. Translated from *La Nature*.

of sensibility and those of movement; to determine the courses of the two kinds of nerves in the various parts of the body. We know how excitations, according to their intensity or nature, act on these organs. We have measured the rapidity with which that still mysterious agent, which bears to the muscles the order for motion, travels in the nerves and in the spinal marrow. We have separated the action of the muscles in their elements, — undulatory vibrations which traverse the length of the muscular fibre. Finally, we have studied the nature of contractions, and know how fatigue, heat, cold, and poisons affect these movements.

On the other hand, while considering the mechanical conditions of animal locomotion, we have determined, from a kinematic stand-point, the characters of the various movements of man and animals. We have classified according to their kind the different bony levers of the skeleton, have determined the centres and radii of curvature of the joints, and have estimated the momentum of the opposing forces which represent the power and the resistance in the animal machinery.

It appears now that every thing is ready, and that physiologists have only to apply these studies to the various problems of practical life. They will teach us, doubtless, how best to utilize the muscular work of man and of the domestic animals; they will lay down rules which shall control the physical exercises of the young, the work of the artisan, the drill of the soldier.

Unfortunately it is not so. Limited as they are, physiologists are scarcely able to study the vital functions in man and the more important animals; besides, the usual method, vivisection, which has disclosed so much in regard to the properties of the tissues and the functions of separate organs, cannot discover the regular action of normal life.

The writer of this article has spent long years in his search for methods and an apparatus capable of faithfully interpreting the external signs of the functions of life. The pulsations of the heart or the arteries, the respiratory movements, the contractions of the muscles, record themselves with this apparatus, and obtain, for analysis, curves in which the least details of the movements are represented. The object of other instruments is to trace the course traversed by a man or by an animal, or to express the efforts developed as functions of the time. Recently, instantaneous photography has completed the knowledge of physiological movements, so that to-day we can easily solve most of the problems of the animal mechanism.

But if the methods were perfected, if new apparatus were invented, all the difficulties would not be removed; for it is not in the ordinary physiological laboratories that one can study the motions of a bird on the wing, of a galloping horse, or of a man walking, running, or performing some other muscular exercise. It was to promote these researches on the physiology of man and animals, that the physiological station, of which we will give a description, was erected.

Only the municipal council of Paris could grant land adequate for this kind of experiments. There was a very convenient place on the Avenue des Princes, near the Porte d'Auteuil. With the generosity always shown when science is concerned, the council granted these lands, and even voted a subsidy to cover a part of the expense of experiments. On the other side, Mr. Jules Ferry, the minister of public instruction, pleaded warmly before the chambers in favor of the contemplated establishment. A law, passed in August, 1882, granted the sums for the construction of the necessary buildings. The work was pushed actively forward during the last autumn and winter, and in March experiments were begun at the physiological station.

The practical applications of physiology are infinite; but in this vast number there are certain questions whose solution is near at hand, certain others for which nothing is prepared. The management of the physiological station, although the subsequent needs are foreseen, is, for the present, arranged for the study of the animal mechanism; and the experiments under progress relate to human locomotion.

The problems which present themselves first of all are the following: 1°. To determine the series of motions which are produced in human locomotion of various kinds, — walking, running, leaping; 2°. To search for the external conditions which influence these motions; those, for instance, which increase the rapidity of pace or the length of step, and which thus exercise a favorable or an unfavorable influence upon the locomotion of man; 3°. To measure the energy expended each instant, in the various acts of locomotion, in order to discover the most favorable conditions for the utilization of this energy. Instantaneous photography, and various other appliances of the graphic method, help to solve these problems, which are impossible to direct observation.

Before entering into the details of the experiments, we will describe the general arrangement of the physiological station. Fig 1. shows the land and the building as a whole. A circular and perfectly level course is laid out in a piece of ground used by the city of Paris as a nursery. This course has two concentric tracks: the inner one, four metres wide, is for horses; the outer one, for men. Around these tracks runs a telegraph-line, whose poles are fifty metres apart. Every time a walker passes a post, he causes a telegraphic signal; and this is recorded in one of the rooms of the principal building. We shall refer later to this kind of automatic record, by means of which, for every minute, the rapidity of the walk, the accelerations and diminutions, and even the number of steps, may be known. In the centre of the course is an elevated platform, on which a mechanical drum beats the time for the step. This drum is worked by a special telegraph-line, coming from a room in the large building where the rhythm is maintained by a mechanical interrupter.

From the centre of the course runs an iron track, on which rolls a little carriage forming a photographic studio. From within this apartment a set of instantaneous pictures of the men and horses whose gaits

are to be studied, may be taken. These photographs are taken as the walker passes before a black screen. Finally, the dynamographic studies, to measure the energy exerted in the various muscular motions, are possible by means of apparatus which will be described later.

Our readers are already familiar with the history, in detail, of the applications of instantaneous photography to the analysis of the locomotion of man and animals. Many have seen the beautiful pictures obtained by Mr. Muybridge, who has succeeded in photographing a horse running at full speed. For the

appear in white the men and animals whose pictures are being taken, as well as the instruments for measuring the distance run, and the time consumed between two successive photographs.

Fig. 2 represents the photographic chamber where the experimenter is. This room is on wheels, and is arranged on an iron track, so that it may approach or move from the screen, according to the objectives which are employed, and the desired size of the photograph. Generally it is convenient to place the photographic apparatus about forty metres from the screen. At this distance, the angle at which

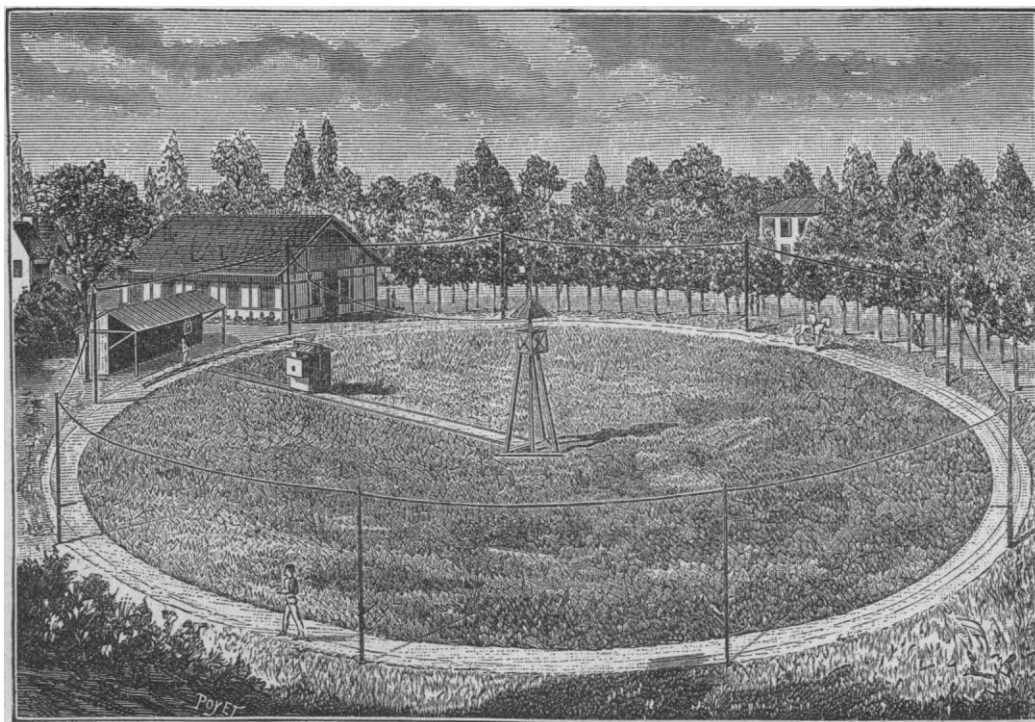


FIG. 1. — PHYSIOLOGICAL STATION AT PARIS.

requirements of the physiological analysis of movements, we have substituted for the complex apparatus of Mr. Muybridge a simple contrivance, giving on the same plate the successive positions of a man or an animal at various instants of his passage before the black screen. We shall refer to these experiments in order to describe certain improvements which make the figures more clear, the time-measurements more exact, and which, by multiplying almost indefinitely the number of images, give a complete analysis of all kinds of movements.

The apparatus employed at the physiological station for the instantaneous photography of movements comprises two distinct parts, — first, the photographic apparatus, with the room on wheels, which holds it; and, secondly, the black screen, on which ap-

the subject to be photographed is presented, changes little during his passage before the black screen. From the outside of this building may be seen the red glass through which the operator can follow the various motions which he is studying. A speaking-trumpet enables him to direct the different movements which ought to be made. The front wall of the building is raised in the figure, in order to show a revolving-disk, provided with a little window, across which the light passes intermittently into the objective. This disk is of large size (1.30 m. in diameter), and its window represents only a hundredth of its circumference: hence, if the disk revolve ten times a second, the duration of the lighting is only one-millionth of a second. The movement is recorded on the disk by wheel-work, which is wound

by a crank, and set in motion by a weight of a hundred and fifty kilograms placed behind the building. A brake checks the disk. A clock-bell, regulated from within, notifies an assistant either to set in motion or to stop the disk.

Fig. 3 shows the interior arrangement of the chamber. The removal of one of the side-walls discloses the photographic apparatus, *A*, placed on a bracket, and directed toward the screen. This instrument receives the long and narrow sensitive plates, which just admit the image of the whole screen. The plates which give the best results for the shortest exposures are those of Van Monckhoven of Ghent, and that of Melazzo of Naples. At *B* is the revol-



FIG. 2. — ROLLING PHOTOGRAPHIC CHAMBER.

ing-disk, which produces the intermittent light; at *D*, a shutter, which is raised vertically at the beginning of the experiment, and falls at the end in order that the light may enter the apparatus only during the time absolutely necessary. *E* is a long slit which un.masks before the objective the field in which the movements to be studied are taking place. The darkness of the chamber permits one to handle at his ease the sensitive plates, and to change them for each experiment.

(To be continued.)

SEPTEMBER REPORTS OF STATE WEATHER-SERVICES.

THESE reports emphasize the general lack of rain, which, without exception, was characteristic of the weather prevailing in every state issuing reports.

The low mean temperature is also made a subject of note.

Georgia. — In this state there has been no general rain since April 23, and the crop reports are in consequence unfavorable. Cotton averages sixty-two per cent, and corn seventy-six per cent, of the usual yield. The temperatures ranged between 45°, the minimum in the northern portion, and 95°, the maximum in the southern section. The average rainfall was 1.57 inches.

Indiana. — The temperature averaged 3.5° below the normal for September; and frosts occurred on the 6th, 10th, and 26th, damaging late corn and other vegetation. The prevailing wind was north-east.

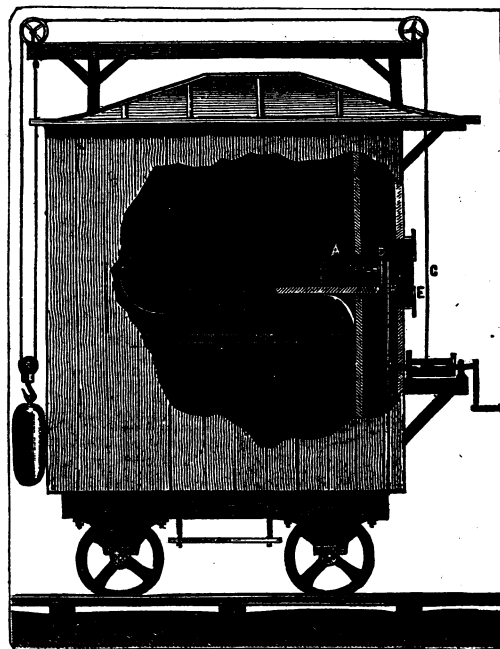


FIG. 3. — INTERIOR OF PHOTOGRAPHIC CHAMBER.

The rainfall ranged from 0.15 inch to 5.98 inches, averaging 1.99 inches for the state.

Kansas. — At Lawrence the rainfall was smaller and the temperature lower, with one exception, than any other September for sixteen years. Rain fell on seven days, and there was but one thunder-shower. The mean cloudiness was 40.33 per cent, the month being 0.31 per cent clearer than usual.

Missouri. — At St. Louis the rainfall was less than a hundredth of an inch, which has not happened before since Dr. Engelmann began his observations in 1839. The normal rainfall at St. Louis is three inches. Several other stations report no rainfall. Light frosts occurred, but without material damage to the corn-crop, except over limited areas on low ground.

Ohio. — The barometric conditions were normal; but the temperature was about four degrees below the

average, and the rainfall showed a deficiency of nearly an inch. The bureau is gradually increasing the number of stations, and makes special efforts to have its observers supplied with standard instruments. In addition to its regular stations, it invites the co-operation of voluntary observers, and will furnish reliable instruments at reduced prices. The rainfall chart published by this service is deserving of being introduced into other similar reports.

Tennessee. — The continued drought has damaged the crops, especially in the eastern portion; but in the middle portion the crops are in fair condition. Frost visited some localities, the temperatures in the state ranging from 32° to 95°. The prevailing wind was north; the average rainfall, 2.06 inches; the average number of clear days, 14.

LETTERS TO THE EDITOR.

Teaching language to brutes.

Is it not quite conceivable that some of the lower animals might be taught to use human language rationally? No doubt the reasons for a first hasty answer in the affirmative would be that the animals seem so intelligent as sometimes even to reason, and that they have, in fact, often had human words put into their mouths, and that they seem sometimes to have a language among themselves. Yet, after all, cannot their intelligence, and even wisdom, and occasional apparent reasoning, be satisfactorily explained, without attributing to them true reasoning, as the result of hundreds or thousands of generations of experience and transmitted memory, by which certain objects or actions become associated with a feeling of pleasure or pain that induces pursuit or avoidance? How few, indeed, are the cases that cannot readily be so explained, where an animal appears at first sight to exercise a reasoning-power! and how extremely simple the effort seems then to be!

True reasoning can always be reduced to the syllogistic form, in effect a statement that what is true of a class is true of something in that class. In order, then, to reason, properly speaking, it is necessary to use a general term (a word or sign with the meaning of a common noun) to indicate the class; and, as we do not know of any evidence that brutes have such words or signs, we have no proof that they can reason. In like manner, the lack of evidence that they can reason goes far towards showing that they have no language that includes such general terms, though it may be true that they sometimes understand words in a singular (not general) sense, and have similar expressions for their own feelings.

The question, then, is whether brutes may not be taught the intelligent use of general words or common nouns, which would enable them to reason. As the step does not seem so very enormous from the undeniable intelligence of some brutes to the lowest form of generalization, it is perhaps worth while to consider how they might possibly be taught to take the step, in hope, that, having once taken it, they might be led farther with still greater ease. Since the idea of plurality appears to lie at the very bottom of the idea of class, number would perhaps be the first and simplest step in generalizing, — number, that is, the regarding things merely as individuals or units. It is a step beyond, to regard things as alike in more complex respects. If that is so, the first effort might be made to teach how to count, and, of course, at the

beginning only to count up to two. If that can be accomplished, still further counting can unquestionably be taught, and no doubt by degrees a much greater amount of generalization and reasoning itself. Does it seem impossible that a brute may learn to associate invariably the word 'one' with a single object, and 'two' with a pair of objects, no matter of what kind? At first the two objects should always be two like ones; but by degrees a difference in them might be allowed. The teaching of common names might next be taken up; or it might be begun along with the counting, but without the confusing addition of any plural termination. Even if the mere counting up to two could not be taught successfully to any single individual brute, yet the end might nevertheless be attained, perhaps, in several generations.

The question then comes, With what animal would it be best to begin such experiments, — whether with monkeys, or elephants, or birds, or ants? Of course, articulation is not essential; for a language of signs might be devised suitable to the animal, — a language corresponding to the deaf-and-dumb one of signs, or to one using the Morse alphabet, or something like it. Elephants are very intelligent, but so very long lived that it would take ages to observe the effect of training through many successive generations. Perhaps the convenience of excellent articulation and rapid propagation, both combined with apparently good intelligence, might give the preference, on the whole, to a talking bird, such as the Indian mynah. **L. B.**

Nov. 9, 1883.

Climate in the cure of consumption.

In your issues of Sept. 28 and Oct. 5, Dr. S. A. Fisk of Denver, Col., compares the climates of the principal health-resorts of the United States with one he happens to represent, i.e., Colorado. At the commencement of his paper the writer states that "he has given the data for Augusta, Ga., as the best substitute for Aiken, S.C., at which place there is no signal-station; and, in doing so, he thinks that he is presenting data which will fairly represent the climatic condition of Aiken." To those familiar with the two places, this is, indeed, a most astounding revelation; and, with your kind permission, I hope to prove, that, although socially very dear to each other, they have climatically but little in common. Augusta is built upon a marshy flat on the Savannah River, which at times overflows its banks, and submerges a portion of the city; while Aiken is located in what is known as the sand-hill region, five hundred and sixty-five feet above sea-level, which is higher than any other town or village within a radius of seventy miles. The soil of the latter place is dry and porous; and to obtain water, wells have to be sunk to a depth of from a hundred to a hundred and twenty feet; and there is no water-course within two miles of the town, and even at that distance there are but brooks or small creeks. The result of this absence of soil-moisture, and of large bodies of water, would of itself tend to diminish the amount of humidity in the atmosphere; but this is still further diminished by the absence of any hill or mountain to interrupt the free circulation of the wind. Augusta, on the contrary, is situated, as before stated, on a plain lying between a range of hills and the river. All this would lead one to expect that the climate of Aiken would be extremely dry; and that this is really the case is proved by carefully conducted observations extending over many years, which show that the average relative humidity, fifty-eight per cent, is lower than that of any other station east of the Rocky Mountains, and eleven

degrees less than the figure given by Dr. Fisk as the mean of four years' observation at Augusta. As further proof of the dryness of the atmosphere of Aiken, I would direct attention to the absence of mould on boots and shoes, and to the fact that guns, and even delicate surgical instruments, may be exposed to air for months at a time without rusting. There are many other differences between the climates of Aiken and Augusta; but the above is sufficient to show that Dr. Fisk has indulged in an inference, when, with a little trouble, he could have obtained facts, the meteorological data for Aiken being on file at the office of the chief signal-office, U. S. A., since the establishment of that bureau, and prior to that time at the Smithsonian institution, not to speak of various publications on the climate of Aiken, which have appeared in the different medical journals of the country.

W. H. GEDDINGS.

Aiken, S.C., Nov. 5, 1883.

On the possible connection of the Pons-Brooks comet with a meteor-stream.

I desire to call attention to some slight evidence of the existence of a meteor-stream which may possibly stand in some sort of connection with the Pons-Brooks comet. From an examination of all the available material of published meteor-tracks in the interval Dec. 5-8, I find, that after excluding those manifestly emanating from the well-known and active radiants in Andromeda, Gemini, and Taurus, there remain twenty-three meteors observed by Heis on Dec. 8, — about two-thirds of them in 1847, and the rest in 1855, 1857, and 1867, — and ten meteors observed at Vienna, Dec. 7, 1868; all of which indicate a strongly marked radiant in Draco. From these data I have carefully determined the position of this radiant, as follows:—

	R. A.	Decl.	Long.	Lat.
10 meteors on Dec. 7,	198.0°	+72.0°	135.0°	+65.6°
23 meteors on Dec. 8,	190.0	+69.7	137.2	+62.4

and from these I derive the following orbits, to which I add for comparison that of the Pons-Brooks comet.

	Meteors of		Pons-Brooks comet.
	Dec. 7.	Dec. 8.	
T = Perihelion passage.	Dec. 28.	Dec. 23.	1884. Jan. 25.82.
Long. of perihelion . .	44.5°	55.1°	93° 21'
Long. of node	256.1	256.3	254 6
Inclination	68.5	72.7	74 3
Log. per. dist.	9.9600	9.9784	9.8894
Eccentricity	—	—	0.9550

The resemblance is thus not sufficient to give any considerable probability to the hypothesis of an intimate relation. On the other hand, the position of the radiant from present data is too uncertain to enable us to pronounce against that hypothesis.

The differences in inclination and longitude of perihelion are not greater than are due to uncertainty in the observed radiant points: the T and the

node are, of course, of no significance in the comparison. The descending node of the comet's orbit lies at the distance 0.200 inside the earth's path, and the difference of the perihelion distance of the comet and the meteors is about 0.15. There is nothing in our present knowledge of the dimensions of meteor-streams, or of the nature of their relations to comets, definite enough to render such a breadth as is here implied evidence against a possible connection. On the whole, therefore, it appears desirable that meteor-observers should give close attention to the radiant in question about the date of the earth's passage through the plane of the comet's orbit, Dec. 5 to Dec. 7. Observations this year are likely to prove especially instructive on account of the proximity of the comet, which passes the node only a few weeks later.

S. C. CHANDLER, Jun.

Harvard college observatory,
Nov. 12, 1883.

Prize-essays on the experimental method in science.

Dr. Maurizio Bufalini, an Italian *savant* who died nearly ten years ago, left provision in his will for the payment of a prize to the person presenting the best essay on the subject of 'the experimental method in science' to the section of medicine and surgery of the Royal institute of higher studies at Florence. The essay must be written in Latin or Italian, and be presented to the chancellor of the section of medicine and surgery on or before the 31st of October, 1884. The prize is five thousand francs.

The institute has declared that all persons are at liberty to compete for this prize; and accordingly the representative of the Italian government, acting under instructions from that government, forwarded to our Department of state a programme giving in detail the subject proposed for the essay, and the conditions to be followed by the competitors, with a request that it be brought to the attention of Americans. The programme has been forwarded to the Bureau of education by the Department of state, and will be published as a bulletin as soon as practicable. In the mean time, such information, relative to the matter, as the Bureau of education possesses, may be obtained by addressing Gen. Eaton, commissioner of education, Washington, D.C.

CHARLES WARREN.

Bureau of education, Washington,
Nov. 9, 1883.

The model of Architeuthis at the Fisheries exhibition.

In the number of SCIENCE for Nov. 9, you have copied without correction a photograph of part of the London International fisheries exhibition, which shows my model of Architeuthis wrongly put together. For convenience of packing, the tentacular arms were made to take apart in three pieces; but, when the model was set up, the basal and terminal pieces were put together, making the tentacles ten feet too short. The man who had charge of the work, not knowing what to do with the remaining pieces, stuck them in at the sides of the mouth, thinking that he might find in some other box a pair of terminal clubs to put on them. In this way the model was left at the opening of the exhibition, until some visitor happened to notice the mistake, when, I believe, the extra pair of arms was taken out, leaving the tentacles still too short.

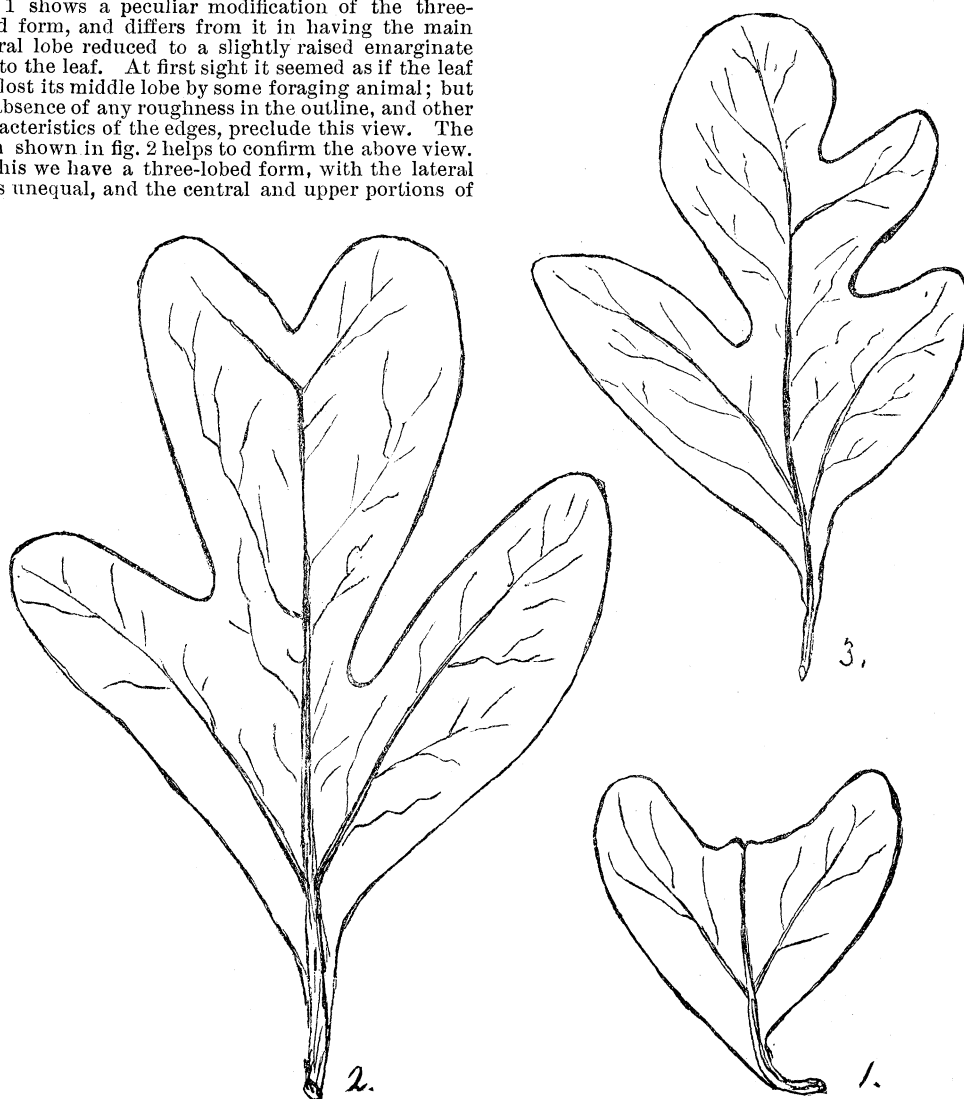
J. H. EMERTON.

New Haven, Nov. 11, 1883.

A strange sassafras-leaf.

The observations upon the sassafras-leaves—a report of which appeared in *SCIENCE*, no. 36—have been continued through the year, with results which do not differ materially from those already given. Three other forms, however, have been found, which are given in the accompanying outline-engravings. Fig. 1 shows a peculiar modification of the three-lobed form, and differs from it in having the main central lobe reduced to a slightly raised emarginate end to the leaf. At first sight it seemed as if the leaf had lost its middle lobe by some foraging animal; but the absence of any roughness in the outline, and other characteristics of the edges, preclude this view. The form shown in fig. 2 helps to confirm the above view. In this we have a three-lobed form, with the lateral lobes unequal, and the central and upper portions of

ner in which this has been accomplished is simple, and is fully shown by the outline given. The middle lobe has become lobed upon one side,—a 'thumb' has formed; and, were the lower portion of the leaf removed, it would leave a 'mitten' of good shape. The whole framework of the leaf has become somewhat distorted: the mid-rib does not take a direct



the leaf inverted heart-shaped (obcordate). The mid-rib has stopped short, and divided into two equal parts, which run to the tips of the two diverging lobes. If this failure of the mid-rib to extend had taken place earlier, a leaf might have been produced similar to the one shown in fig. 1.

The most interesting of the three new forms is shown in fig. 3. Here we have a happy combination of the three-lobed and the 'mitten' form. The man-

course; and the lower lobes are neither equal, nor at the same distance from the base of the leaf.

It is due the reader to state that these three forms were all found upon the same shrub,—not a large one,—and that only a single specimen of each was discovered. These were all upon the same branch, though scattered among fifty or so of leaves of the three forms before described, and which, from their uniform presence, may be considered normal. How

shall these deviations be viewed? Is the foliage of the sassafras passing through a period in which different forms of leaves are being tried to see which is best adapted to the surroundings? It may be that there is a tendency from the simple towards the more complex; and fig. 3 shows the form which may be finally adopted. This is a subject about which even the philosophic botanists know but little; but, when one finds these deviations from the common form, he cannot help wondering after what end the plant bearing them is striving.

BYRON D. HALSTED.

The thickness of the ice in New England in glacial times.

In the issue of SCIENCE for Sept. 28, Professor Wright corrects a reported statement of what he said about the depth of ice over New England, changing 600 feet to 6,000 feet, and giving as proof the well-known fact that Mount Mansfield and Washington show ice-action to a height *above sea-level* of between five and six thousand feet.

It seems to me that the depth 600 feet must be more nearly correct than 6,000 feet. The ice-sheet over New England must have had a thickness equal to the height of these mountain peaks above the level of the contiguous valleys. From the nature of the case we cannot well prove a greater thickness, though from theoretical considerations we may believe the ice to have been much thicker. 4,370 feet, the approximate difference between the top of Mount Washington and the Crawford House, must cover the greatest differences in elevation between neighboring valleys and mountains. The average thickness of the ice-sheet must have been much less (from this proof), possibly not more than 1,000 feet. This thickness would accord with what is believed to be the thickness of the ice to the north-westward.

The glacial striae and drift-boulders upon Mount Washington at an elevation of 6,000 feet do not necessarily lead to the supposition that the upper ice-surface had that level in northern New England, and a greater elevation to the north-westward; for local accumulations of snow and consequent ice must have existed about the summits of the White, Green, and Adirondack Mountains, as in Switzerland and in Greenland at the present time, and have constituted the source of much of the ice which spread southward over southern New England and New York.

L. C. WOOSTER.

Eureka, Kan., Nov. 7.

Museum of the Indiana university.

In the account of the burning of the museum building of the Indiana university, given in SCIENCE for July 27, are one or two errors which need correction.

The Owen collection of minerals and fossils was not entirely destroyed. Eight large cases, including the great majority of the typical specimens of David Dale Owen, were saved. The very perfect skeleton of *Megalonyx Jeffersoni* was also saved.

No specimens belonging to Yale college or to Cornell university were in the museum at the time of the fire. About two thirds of the very large collection made by Professor Gilbert on the Pacific coasts of Mexico and Central America were destroyed; the remaining third having been returned to the U. S. national museum, to which institution it belonged.

A new fire-proof museum building is to be erected at once, and the restoration of the collections lost is rapidly progressing.

D. S. JORDAN.

Bloomington, Ind.

THE FISH-COMMISSION BULLETIN.

Bulletin of the U. S. Fish-Commission, vol. ii., for 1882. [Edited by CHARLES W. SMILEY, A.M.] Washington, Government, 1883. 467 p., illustr. 8°.

IN looking over the pages of this book, we find several papers of marked scientific value, written by eminent specialists in biology and fish-culture,—articles which of themselves are sufficient to give this document a prominent place upon the book-shelves of naturalists, and to render it a valuable book of reference, especially to embryologists and fish-culturists.

The articles written by J. A. Ryder deserve prominent notice; for not only do they have an important bearing upon the subject of embryology, but they also show the importance of scientific treatment in hatching and maturing fish-eggs. The two most important papers by this author are, 1°, The absorption of the yolk in the embryo shad; 2°, Microscopic sexual characteristics of the American, Portuguese, and common edible oyster of Europe compared. Several smaller papers by the same author have especial bearing upon the successful hatching and rearing of the food-fishes of the Potomac.

The papers upon the distribution and specific character of fishes, with descriptions of new species, will be of special interest to systematic ichthyologists. A large part of the book is composed of letters of greater or less importance, written to the commissioner, mainly relating to the movements of fish in certain districts. We are of the opinion that a great many of these letters might have been left out entirely, without any serious loss to science. They might at least have been judiciously cut down, and published together as a series of notes; thus giving the important points, and omitting the great preponderance of useless words and sentences which one so frequently finds in these letters. The last article in the book is entitled, "A geographical catalogue of persons who have stated that they are interested in fish-culture," by C. W. Smiley.

Sandwiched between these various papers, we find one, which, in our estimation, is grossly unfit for a scientific publication of such a high standard. The title of this article is 'Life in the sea,' by J. B. Martens. It is a translation from the Dutch; and the author is teacher of natural sciences at the seminary of St. Nikolas, Belgium. From beginning to end, it is an absurd misrepresentation of facts, and deserves the severest condemnation. For instance: we find in the introductory paragraph the statement that "life in the sea

shows still greater abundance and variety" than life on the land. We cannot understand why such an article should be translated from a foreign language at considerable expense to the commission. To say the least, it shows a lack of discretion on the part of the editor; for, were articles of a popular nature desirable, it would not be necessary to incur the expense of translating, since hundreds of popular articles, with fewer misrepresentations, and of far more scientific import, could be found in our ordinary newspapers, and published with much more credit to the commission. When, moreover, it is an open secret that there are papers of real scientific value, written by eminent naturalists, kept waiting for an opportunity of appearing in one of the Fish-commission publications by the great mass of material to be issued before them, the folly of burdening the pages of the Bulletin with material of this kind becomes only too evident.

BRIGGS'S STEAM-HEATING.

Steam-heating: an exposition of the American practice in warming buildings by steam. By ROBERT BRIGGS. N.Y., Van Nostrand, 1883. (Van Nostrand's science series.) 108 p. 24°.

THIS little volume is one of the latest issues in the 'Science series,' and is one of the most valuable of a collection of monographs which includes an unusual proportion of excellent contributions to science and to engineering literature. The author of the paper, Mr. Robert Briggs, who died just before the publication of this last of his many papers on the science and the arts of engineering, was well known, both at home and abroad, as one of the ablest writers in the profession. This paper was written as his last annual contribution to the proceedings of the Institution of civil engineers of Great Britain, of which great association he had long been a member.

The subject of steam-heating is here treated from a purely practical stand-point, and the paper is full of useful information. An historical introduction is given, in which the introduction of this method of heating dwellings is ascribed to the late Mr. Joseph Nason of Boston, who was a pupil of the celebrated Jacob Perkins. Later, Messrs. Walworth of Boston, Gregg and Morse and Professor Mapes of New York, Greenwood of Cincinnati, and Tasker of Philadelphia, were influential in perfecting the system in the United States.

In heating by steam, welded wrought-iron tubes are employed, united by a system of screw-threads, which have been brought to cer-

tain standard forms and dimensions peculiar to the trade. The size of the tubes, and their thickness, are also fixed in accordance with settled standards. Tables are given of these sizes. The forms of the various kinds of couplings and other uniting parts are prescribed by standard practice, and the author gives tables of their principal dimensions.

The steam-boilers in use in steam-heating are usually, in the United States, either the common horizontal tubular boiler, or that form of the so-called sectional boiler known as the 'Babcock & Wilcox.' Both of these boilers are stated to be practically safe from disastrous explosion. Probably one-half of all the boilers in use are of the first type.

The two methods of heating most in vogue are that in which 'live' steam is carried direct from the boiler to the heating-pipe, and that in which 'exhaust-steam' from a steam-engine is employed. Both systems are often in use together. Several methods of application of the former system are practised, all of which have advocates among old practitioners. Loss of heat by conduction and radiation from the heating-pipes, where such disposition of heat is likely to be objectionable, is prevented by the non-conducting coverings, such as hair-felt, porous plaster, etc.

The diffusion of heat in the apartments to be warmed is accomplished by the use of radiators. The communication of heat to the air to be warmed may be done either in the rooms to be warmed by it, or before the air enters the rooms. Direct radiation in the apartment is effected by the use either of series of pipes properly set, or of slabs of wrought or of cast iron, hollow, and strong enough to receive the pressure of steam safely. In many cases the heating-pipes are placed overhead, and this system has been found perfectly satisfactory.

Systematic ventilation is usually combined with steam-heating, and in large buildings the air-currents are produced by the action of blowing-fans. This method of heating and ventilating is often carried out upon a very extensive scale. A large office in New-York City contains 1,923,590 cubic feet of space, occupied by 1,300 people, and is heated by a system in which are used 8 boilers having 173 square feet (16 sq. m.) of grate, and 8,000 square feet (743 sq. m.) of heating-surface. The state lunatic-asylum of Indiana, at Indianapolis, contains about fifty per cent more space.

Steam-heating is now adopted in the United States for all large buildings. An appendix to Mr. Briggs's paper contains tables of the

more important data in use in the computation of efficiency, etc. The book is likely to prove very useful to engineers engaged in this department of construction.

NEW-YORK AGRICULTURAL STATION.

First annual report of the board of control of the New-York state experiment-station, for the year 1882. Transmitted to the legislature, March 6, 1883. Albany, Weed, Parsons, and company, pr., 1883. 156 p. 8°.

THE rapid multiplication of agricultural experiment-stations in this country during the last few years has been one of the most encouraging signs of the times to those who have at heart the advancement of agricultural science, and the application of rational and scientific methods to the prosecution of a calling which has contributed, and will in the future contribute, so much to our national welfare. Since the establishment of the first state experiment-station, somewhat more than six years ago, their number has steadily increased, until now there are seven such stations, besides some half-dozen institutions which are experiment-stations in fact, though not in name. Those who are familiar with the gain which has accrued to agriculture through the work of such stations in other countries cannot but be solicitous that the movement in our own land shall be wisely guided, and that every new station shall have a high ideal as regards the kind and quality of its work.

The first report of the New-York state experiment-station is worthy of more than a passing notice, for the reason, if no other, that it seems to enunciate a view of the duties of an experiment-station.

If we correctly apprehend the introductory paragraphs of Dr. Sturtevant's report, he holds that an experiment-station, or at least the station of which he is director, should select chiefly so-called 'practical' subjects for investigation; that is, as we understand it, subjects pertaining to the art rather than to the science of agriculture. This view has evidently been put in practice during 1882. Thus a large amount of work has been done in testing the comparative value of divers varieties of field and garden plants. Fifty-eight varieties of garden-beans have been grown; their times of vegetating, blooming, becoming edible, ripening, the number and weight of seeds produced per plant, etc., noted; and a detailed description of the botanical characters of each variety prepared. Many varieties of other garden-seeds have been compared in a similar man-

ner; and the same is true of several varieties of maize, oats, and barley. Other subjects of a similar character are, the value, as seed, of butt and of tip kernels of maize, of whole potatoes and single eyes variously cut, of level and of ridge culture for potatoes, etc. We would not be understood as implying that all the work of the station is of this character, but it is plain that the tendency has been in this direction. The institution has been in many respects more nearly what is generally understood by an experimental farm than an experiment-station.

That the director of the New-York station should hold a view of the duties of an experiment-station differing from that generally entertained is, of course, no ground for adverse criticism, except in so far as it tends to obscure the signification of the name. Neither can it be claimed that the work done has not been well done, or is not useful; though we venture to think that much of such work must generally be published either too early to allow of its being properly verified, or too late to be of much service. What we object to is the deliberate and avowed adoption, by the largest and most liberally supported of the American stations, of what seems to us a low view of its duties to its constituents and to science,—a view which fosters the demand, on the part of the public, for a species of cheap experiments, easily and rapidly made, and of little permanent value.

An agricultural experiment-station exists for the purpose of investigating the applications of natural science to agriculture. It is primarily a scientific institution, concerning itself with the science and not with the art of agriculture, and, in our opinion, can only attain to the best and most enduring success when it keeps this fact steadily in view, and devotes its energies mainly to the discovery of new truths, and the verification of old hypotheses, in the science of agriculture. That a lower aim will prove more popular need hardly be said; and, since public institutions exist by popular favor, that favor must be secured in some way. Moreover, it is impossible to draw an exact line between experiments which advance the science and those which advance the art. At the same time, fully admitting that the work of an experiment-station ought to be guided by the desires of its constituents to a certain extent, we hold that it is equally its duty to guide and educate public opinion to the point of supporting it in undertaking work of scientific value.

We urge this, not simply because of the

advantages to science, both agricultural and to a less extent general, which would result, but because we believe such a course to be the only one which will lead to enduring popularity, or yield gains to agriculture commensurate with the outlay. We are confident, that, if Dr. Sturtevant will make it his avowed aim to do as much real scientific work as possible, the state will receive a far larger return for its outlay, and that within no long time it will acknowledge such to be the case; while the beneficial effects of such a course, in promoting an appreciation of and respect for true science among the people, would not be its least recommendation.

Agricultural experimentation is attracting increasing attention; and it seems important that a clear idea should be reached by those concerned in it of its proper aims and methods; and this can be attained in no better way than by a free criticism, on the part of all concerned, of methods and ideas which seem to them false or unwise.

HERRICK'S TYPES OF ANIMAL LIFE.

Types of animal life, selected for laboratory use in inland districts. By C. L. HERRICK. Part i., *Arthropoda*. Minneapolis, 1883. 33 p., 7 pl. 8°.

THE author says in the preface, that the notes which this work contains are only a small part of the material collected some years ago for a 'Laboratory assistant for western students, arranged upon quite a different plan.' During the delay in completing the proposed work, the great need of it has been in a measure supplied by recent works; but as these treat chiefly of marine forms, or such as require dissection, he has 'thought best to place at the disposal of students and teachers in summer science classes' his notes on such types as can be studied, while living, under the microscope. The types selected are the larva of *Corethra*, *Canthocamptus*, and *Gammarus*, which are de-

scribed, without directions to the student, or explanations of methods of work.

A text-book of this kind ought to be clearly written, and accurate, a model for the student; but Mr. Herrick's work is far from this, and no better than we might expect to find the rough notes of the student in a 'summer science class.' The description of the heart of *Chironomus*, on p. 7, is throughout almost or quite unintelligible, and ends with the statement that 'the last chamber is closed behind, and has the ostia quite a distance beyond.' On p. 25 we have the opening of the green or antennal gland of *Gammarus* described as 'an auditory or other sensory organ;' and on plate 8, an antennula, or first antenna, figured, for comparison, as the 'second antennae of prawn, with auditory sac and secondary flagellum.' The Copepoda are Mr. Herrick's specialty, and so we naturally turn to the chapter on *Canthocamptus* for better work: but in the first paragraph we are told that the Copepoda are divided into three sections, — *Gnathostoma*, having 'the mouth-organs in the form of jaws;' while 'the other sections, *Poecilostoma* and *Siphonostoma*, have the mouth-parts more or less modified for piercing or sucking.' The student may search long and unsuccessfully to discover what the '*Poecilostoma*' may be. In this chapter, also, we naturally look for some account of the 'heterogenesis' of which Mr. Herrick has written elsewhere, and find the following: —

"The young of *Canthocamptus* become fully developed sexually before they assume their final form; and it is not unusual to find females bearing egg-sacs which are not only much smaller than the parent, but with considerable differences in the various organs. This sort of heterogenesis is not uncommon among lower crustacea, for the mother may differ much from the young till after they have themselves produced young."

Grammatical, verbal, and typographical errors so abound that it is needless to point them out. The illustrations, engraved by the author himself, are for the most part far from accurate, and very rude.

WEEKLY SUMMARY OF THE PROGRESS OF SCIENCE.

ASTRONOMY.

Photographing the solar corona without an eclipse. — Dr. Huggins has continued his experiments on this subject during the past season. He has made use of a fine seven-and-a-quarter-inch speculum by the late Mr. Lassell (loaned for the purpose

by Miss Lassell). Three inches and a quarter of the central portion only are employed, the light being received a little obliquely, so as to throw the image to one side, as in the Herschellian telescope, thus avoiding a second reflection. The absorbent screens of potassic permanganate, or blue pot-glass, have been dispensed with, and an emulsion, prepared specially

for the purpose by Capt. Abney, and containing only chloride of silver, has been generally used for the sensitive plate. This film is said to be sensitive only to rays between h and H , or at least to be only slightly affected by rays of either higher or lower refrangibility. Between April 2 and Sept. 4, fifty plates have been exposed on fifteen different days; and all of them are said to show a more or less distinct coronal appearance around the sun.

The plates have been put into the hands of Mr. Wesley, the celebrated engraver, who made the magnificent plates of Mr. Ranyard's Eclipse volume; and he has prepared for each day a drawing of what he could make out on all the plates taken on that day. "This was desirable," as Dr. Huggins says, "because, whenever sufficient duration of sunshine permitted, photographs were taken on silver-bromide films as well as on silver-chloride plates: some photographs were taken with the sun screened off by a brass disk (close to the plate), others without it: also photographs were taken with the sun in different portions of the field. As a rule, Mr. Wesley has introduced into his drawings only those coronal features which were common to all the plates taken on that day."

Four drawings were presented, each of them showing incontestibly details belonging to the lower portion of the corona. The paper was presented to the British association. — (*Brit. journ. phot.*, 1883, 575.) C. A. Y. [380]

Saturn. — Dr. William Meyer of Geneva gives the results of a large series of measures of Saturn and his rings. The measures agree very well with those taken in 1880. He also determined the position of the belt in the southern hemisphere of the planet. Encke's division was observed several times, and its position seemed to be nearer the exterior edge on the left than it was on the right ansa. On one occasion the ball seemed of a grayish-blue tint, while the ring was glittering white in color. — (*Astr. nachr.*, 2,517.) M. MCN. [381]

MATHEMATICS.

Equations of equilibrium. — M. Appell remarks that the analogies between the equations of equilibrium of a flexible and inextensible thread, and the equations of motion of a point, have long been noted, but that no one has put these equations of equilibrium into their canonical form, which would permit the application of Jacobi's principles. M. Appell considers first the case of a free thread acted on by forces possessing a potential, and transforms the equations of equilibrium into forms analogous to those giving the motion of a point. He next introduces the notion of generalized co-ordinates, q_1, q_2, q_3 , replacing x, y , and z . The transformations made here are quite similar to those given by Jacobi, in his *Vorlesungen über dynamik*. The author finally studies the position of equilibrium of a thread acted upon by the same forces as before, but constrained to lie upon a given surface. — (*Comptes rendus*, March 12.) T. C. [382]

Parallel surfaces. — Mr. Craig gives expressions for the ratio between the corresponding elements of area on a given surface and its parallel. The relations between corresponding elements of length, and

the relation connecting the measures of curvature on both surfaces, are also derived. The area of the parallel to the ellipsoid is obtained as the sum of the areas of the given ellipsoid, a certain derived ellipsoid, and a sphere whose radius is the modulus of the parallel surface. — (*Journ. für math.*, 1883.) T. C. [383]

ENGINEERING.

Simple and compound engines on short routes. — Mr. Boulvin has determined a series of formulas expressing the relations between size of vessel, weights carried, and distances traversed, and the weights of the simple and the compound engine, and finds, that, for short routes, the best form of engine is the single cylinder rather than the compound. He finds that for lines from twenty to sixty miles in length, as those from Dover to Calais and from Ostend to Dover, a gain of a knot an hour may be obtained by the use of the simple engine instead of the compound, in consequence of the saving in weight of machinery. On long routes the economy is on the side of the compound engine, in consequence of the saving in weight of fuel. The later practice of English constructors has been in accordance with this result, and with the principles involved in the work of Mr. Boulvin. He constructs curves showing the equations graphically, and illustrates their use by examples. — (*Ann. trav. publ.*, xli.) R. H. T. [384]

Transportation by steamers on the Rhone. — Mr. F. Moreaux has investigated the conditions of transportation by steam on the Rhone and other fast-running and shallow rivers, and has incidentally developed a new formula for the resistance of vessels, which he applies in his study of the best methods of transporting merchandise.

He takes an expression of the form

$$R = K_1 S' + K_2 \times \frac{l}{p} \times S'',$$

in which R is the resistance, K_1 and K_2 are numerical coefficients, S' and S'' are the areas of the middle body and of the tapered ends of the vessel: l and p are the length and the breadth of these ends. The values of the coefficients vary, according to stated conditions, from 0.10 to 0.22 for K_1 , and from 0.48 to above 2 for K_2 . They can only be used, evidently, in cases in which these conditions are definitely known. Where used as by Mr. Moreaux, however, they give very satisfactory results. The formula is applied to a river-navigation, now conducted largely with steamers about 135 metres long, 7 wide, 1 metre in draught, with 8 square metres area of immersed midship section, 1,100 square metres area of wetted surface, and 900 tons displacement. Their engines are of 1,150-horse power, and their speed is about 4½ metres per second. The current is, in places, nearly 4 metres. Mr. Moreaux concludes that the best system for such river-transportation is that in which is used what he calls the '*Bateau mixte à ancres*,' which is fitted as a towboat, but which is also supplied with anchors of peculiar form and of great holding-power, by which the tug may be held at the head of a rapid, and then, by hauling in a tow-line attached to the tow, bring the latter through into still water. Two.

such boats sometimes act alternately, the one hauling, while the other is getting a new position ahead. The advantages thus secured are, that the propelling craft is not detained at either end of the line of transportation; that transshipment and the breaking of bulk are avoided; that the rapids are surmounted with comparative ease; that canal-boats are thus transportable from river to canal, and the reverse, making long trips through river and canal, and thus saving expense of repeated handling of merchandise. This system is proposed for use between Arles and Lyons. The author proposes the connection of Arles and Marseilles by a canal, and the continuation of this system through the waterway thus formed. — (*Mém. soc. ing. civ.*, April.) R. H. T. [385]

AGRICULTURE.

Hill-culture of potatoes. — Experiments by Wollny having led to the conclusion that hill-culture was superfluous, or even injurious, on light soils, Schleh has made experiments with potatoes which in general have corroborated Wollny's conclusion. — (*Biedermann's centr.-blatt.*, xii. 483.) H. P. A. [386]

Proteine of maize-ensilage. — Stutzer finds, that, in the preparation of ensilage from maize, the proteine is largely broken up into products which are not precipitated by copper hydrate, and which are probably of inferior nutritive value. Jordan has made the same observation in experiments at the Pennsylvania state college. — (*Ibid.*, xii. 497.) H. P. A. [387]

Nitrification in the soil. — Nitrification is dependent on the presence of oxygen, and Schlösing has shown that a diminution of the amount of oxygen present decreases the rapidity of the change. Such a diminution of the amount of oxygen in the soil is effected by the presence of organic matter, which unites with it, forming carbonic acid, and thus acts, as Déhéraïn and Maguenne point out, to moderate the rapidity of nitrification, and so to prevent a loss of nitrates in the drainage-water. The same authors explain in this way the greater richness in nitrogen of untillied land, and claim that the presence of organic matter is necessary in order that the soil shall gain nitrogen from natural sources. — (*Ibid.*, xii. 506.) H. P. A. [388]

MINERALOGY.

Albite. — Des Cloizeaux gives the results of the optical examination of a large number of specimens of albite. Although this mineral is the most constant of all the feldspars in its chemical composition, its variations in optical properties are great, and dependent upon the homogeneity of the material, the number and arrangement of the twin lamellae, and, without doubt, upon the circumstances of temperature and pressure at which the crystals were formed. The following are the properties of the purest and most transparent crystals, which may be regarded as normal: the plane of the optic axes is normal to a surface truncating the acute edge between oP and $\infty \bar{P} \infty$, and making an angle of 101° – 102° with the base; the acute bisectrix is always positive,

and nearly normal to the edge oP and $\infty \bar{P} \infty$; the axial angle for red in oil is about 80° – 85° , ordinary dispersion $\rho < \nu$; the obtuse bisectrix is always negative; the axial angle for red in oil is about 104° – 106° , ordinary dispersion $\rho > \nu$; basal sections give for the angle of extinction 2° – 4° on either side of the plane of twinning; on the brachypinnacoidal section the angle of extinction is nearly 20° . The results of the examination of thirty-four different varieties of albite are given, many of them accompanied by chemical analyses. — (*Bull. soc. min.*, vi. 89.) S. L. P. [389]

METEOROLOGY.

Meteorology in China. — Dr. Doberck of the Hong Kong observatory proposes to study the climatology of the region, to determine the magnetic conditions, and to investigate the magnetic attraction of various mountains and hills in the vicinity. It is probable that he will endeavor to arrange for the receipt of regular reports from neighboring observatories with the object of making weather forecasts. — (*Nature*, Sept. 27.) W. U. [390]

Hygrometer studies. — A good hygrometer which can be used in place of the wet- and dry-bulb thermometers, and be equally convenient, but more accurate in cold weather, is one of the needs of practical meteorology. Comparative observations of the psychrometer and the improved hair hygrometer, as manufactured by Höttinger, have been made at Breslau by Dr. Galle since 1880. As a result, he states, that if the saturation-point is determined at intervals of from eight to fourteen days, and the instrument carefully cleaned when necessary, the relative humidity can be obtained with as great accuracy as with the psychrometer, and in winter with greater accuracy. Unfortunately, there still remains in the instrument the liability to unexpected changes in the saturation-point, and in the working of the mechanism; so that a psychrometer must be at hand for the purpose of comparison. — (*Preuss. stat.*, lxxi.; *Ergb. met. beob. königl. met. inst.*, 1882.) W. U. [391]

GEOGRAPHY.

(Asia.)

Investigations in Thibet. — At the suggestion of Gen. Walker, geodesist-in-chief to the survey of India, an interesting exploration is about to be undertaken by one of the pundits attached to the survey. This pundit was a companion of the famous Nain Singh, and succeeded, in the midst of a thousand obstacles in the eastern part of Thibet, in recording and preserving his itineraries, and obtaining many latitude observations. Thanks to his researches, an area three times as extensive as France can be to a certain extent corrected, and mapped with tolerable accuracy. The great Thibetan problem as to the relations of the Dzang-bo River are probably settled by his work, from which it would appear that this belongs to the head waters of the Brahmaputra rather than (as formerly supposed) to the Irawadi River. — (*Bull. soc. géogr. Mars.*, June.) W. H. D. [392]

(Africa.)

Sociology of the Kabyles.—M. Sabatier, who has long been a resident of Algeria, and served as a judicial officer among the Kabyles, gives the following details as to their civil and social organization. These people, sharply distinguished from the Arabs, are of the Berber race, and number about three hundred thousand.

The villages are associated in governmental groups of not more than twenty settlements each. Such a group is termed a kabila. The supreme chief, or magistrate, of the kabila, is the amin. There is always another chief called ukil, charged with defending the rights of the minority of the electors. In each kabila the karuba, of forty or fifty male adults, forms an electoral body. The right to vote, or the attainment of individual majority, is decided in a singular manner. A thread is measured off, which, when doubled, shall exactly encircle the neck. This thread, made single, is then passed from the occipital base of the head over the cranium; and, when the other end reaches only to the chin, the development of the head is supposed to be complete, and the individual politically mature. This ordinarily happens about the age of fourteen. Each karuba has a distinct jemmâha, a sort of municipal council, presided over by a tamen. The tamens, all together, form the general council of the kabila, which, with the ukil and amin, forms the administration. The rights of minorities in each karuba are carefully guarded. The minority is called the saf, and may elect a chief, who serves one day to redress grievances, after which he retires to his private station. They have no prisons. The grand council may banish a criminal, destroy his house, burn his clothing, or order him, as a last resort, to be stoned to death. The council directs all municipal matters. If hostilities break out between two villages, and blood is shed, neighboring villages generally intervene by proclaiming anaya. This anaya is an invitation to cease hostilities, which the combatants dare not disregard. Were it disregarded, it would be considered an extreme insult to the safs of the peace-making villages, which all other village safs would be bound in honor to avenge.

The family organization of the Kabyles is unique. There is, in fact, no family, in our sense of the word. Such as there is, is terminable conditionally. A Kabyle who desires a wife says to her father and brother, 'You must sell me this girl.' The price is debated, and an agreement made before witnesses. Fifteen to forty dollars is the usual range. The money paid, he gives a dress to the bride, and all is done. The wife may be sent back without explanation, and the price reclaimed from her family.

If the wife quarrels with her husband, she may call upon a third person to proclaim anaya between them. The husband may then not only reclaim his payment to her family, but set on her head a price, often exorbitant, which any other lover must pay into his hands before he can take her to wife. The woman is then said to be 'retired from circulation.'

Children, if boys, are held in honor, representing one more vote and one more gun; girls must shift as

best they may; at least half the Kabyle women live by gathering sweet acorns.

Kabyle law regulates the disposition of property. If a peddler possesses a field which he cannot use on account of the demands of his business upon his time, the law obliges him to plant it with olives. The property in such matters is wonderfully divided up: one man may own the fifth part of a field; another, a fifth of the crop of olives, or a third of the crop of figs; still another, the third branch of the fifth olive-tree, or that branch which points to the east.

In Kabylia the discoverer of a spring of water, even if situated in the field belonging to another person, owns the water from it. This tends to encourage the search for water, the most important element in that arid region. The Kabyles are excellent agriculturalists. If there is a spot of earth in a chasm, a Kabyle will descend by a rope and cultivate it. They are extremely industrious, and work in concert. In the Kabyle country, land suitable for cultivation is worth eighty dollars an acre, while in the Arab districts it does not average four dollars in value, per acre,—a difference illustrating the respective characters of the two races. The question of ousting the Kabyles from the land they cultivate, to make room for French colonists, is being discussed in France: so it would seem that the Americans are not the only people capable of robbing the aborigines. — (*Rev. géogr.*, June, 1883.) W. H. D. [393]

BOTANY.

Columbines.—Grant Allen (*North-American review*, September) traces several of the steps by which the typical ranunculaceous flower has been modified to form that of *Aquilegia* and the other more highly specialized genera. The more important are the elongation of the petal, which "is just the petal of the buttercup, with the tiny depression or hollow of the nectary prolonged backward into a tubular spur," as a protection against small, thieving insects; and the reduction in the number of carpels, without a corresponding lessening of the ovules, which insures a more certain fecundation of the latter. The fact that *A. canadensis* is even more perfectly adapted to pollination by humming-birds than by bees, seems, however, to have escaped him. Though more greatly modified, the hooked spur of European columbines is in no wise more perfectly adapted to the end it is to serve than the straight spur of American species. In his zeal for demonstrating the correlation of highly specialized forms and colors in entomophilous flowers, the writer is also led to ignore such species as the common European *Aconitum lycoctonum*, which, with the structure of its immediate relatives, has the much less specialized yellow color of those lying lower in the scale.

Dr. Gray (*Bot. gazette*, September) calls attention to the longest columbine (*A. longissima*), a species from northern Mexico, with spurs four inches or more in length, and clearly adapted to profit by the visits of some long-tongued hawk-moth like *Amphonyx antaeus*, which occurs in the south-west, and has been found by Mr. Henshaw to have a proboscis cer-

tainly five inches and three-quarters long. It should be stated that all of our American columbines that have been studied, whether fertilized by bees, moths, or birds, are strongly protandrous, like the European species. — W. T. [394]

Symbiosis.—Dr. Sedgwick gives a well-written synopsis of the results of the more important recent studies concerning the occurrence of chlorophyll in animals, and its significance. These seem to show that the so-called 'animal chlorophyll' has no actual existence, being in every case (possibly excepting *Hydra* and *Spongilla*) connected with a vegetable structure living in the tissues of the animal. This association of plant and animal, in the mutual benefits derived, is held to be somewhat different from the so-called parasitism known in lichens; but it is hard to see in what important respect the two cases differ. — (*Pop. sc. monthly*, Oct.) W. T. [395]

ZOOLOGY.

Coelenterates.

The anatomy and histology of *Porpita*.—A diffused nervous system, made up of a plexus of scattered ganglion-cells connected with each other by nerve-fibres, and similar to that described in the *Medusae* and *Actiniae* by the Hertwigs, and in the *Hydroids* by Jickeli, Lendenfeld, and others, has been described by Chun in *Velella*. Conn and Beyer have independently discovered the same structures in *Porpita*; although they express some doubt whether they are really nerve-cells, rather than some form of connective-tissue corpuscle without any nervous function. They incline, however, to the belief that the close resemblance which they bear to cells which have been found in the *Medusae* and *Actiniae* justifies us in regarding them as a very primitive nervous system.

The cells in question are, in *Porpita*, ectodermal; and sections show that they lie actually in the ectoderm-cells, outside the supporting layer and the layer of muscles. They are always found in connection with the muscles, and they are most abundant where the muscular system is most developed. They are bipolar, tripolar, or multipolar; and their processes could be traced to a considerable distance. Their distribution is as follows: they lie wholly in the ectoderm; and their fibres, after running for a considerable distance beneath the outer ectoderm-cells and immediately upon the muscle-layer, finally penetrate this layer, and are lost. The whole of the upper surface of the animal is supplied with them, somewhat sparsely toward the centre, but much more abundantly towards the edge, and especially in the velum. The under surface of the velum has also a rich supply, and the tentacles also contain great numbers; but towards the centre of the lower surface of the disk they gradually disappear, and none could be found upon the nutritive zooids. They are everywhere few in number, as compared with the ectoderm-cells, and they are very irregularly distributed. There is nothing like a central nervous system, and no union of the cells into a nerve-ring could be made out. Conn and Beyer also describe a number of so-

called 'sensory organs,' which are placed in pockets, or pouches, around the edge of the velum. Each of these is filled with large and highly modified ectoderm-cells, which the authors regard as sense-cells. They have no connection with the ganglion-cells. — (*Stud. biol. lab. Johns Hopk. univ.*, ii. 433.) W. K. B. [396]

Mollusks.

Visual organs of *Solen*.—Dr. Benjamin Sharp had been led to believe that *Solen ensis* and *S. vagina*, the common razor-shells, are possessed of visual organs, by observing that a number of these animals which were exposed in a large basin for sale in Naples retracted their siphons when his hand cast a shadow over them. Repeating the experiment at the zoölogical station, he became convinced that the retraction was due to the shadow, and not to a slight jar which might have been the cause. Upon examining the siphon, he found as many as fifty fine blackish-brown lines or grooves between and at the base of the short tentacular processes of the external edge. When a vertical section of these pigmented grooves is made, the cells of which they are composed are found to be very different from the ordinary epithelial cells of the surrounding tissue. The pigment-cells are from one-third to one-half longer than the latter, and consist of three distinct parts. The upper ninth or tenth part of each cell is perfectly transparent, and is not at all affected by the coloring-matter used in making the preparation; the second part is deeply pigmented and opaque, and forms about one-half the cell; while the remainder consists of a clear mass, which takes a slight tinge when colored. This portion contains a well-defined nucleus filled with granular matter, and is probably the most active part of the cell. These retinal cells, if so they may be called, resemble those of the very primitive eye of *Patella*. The value to the *Solen* of an organ which would enable it to detect the shadow of approaching objects as it lies embedded in the sand, with the end of the siphon protruding, must be evident; and the structure of the cells described bear sufficient relation to those of the eyes in *Patella*, *Fissurella*, and *Haliotis*, to make it highly probable that they constitute true primitive visual organs. — (*Acad. nat. sc. Philad.*; meeting Nov. 6.) [397]

Organization of chitons.—A second part of Dr. Béla Haller's valuable investigations of the chitons of the Adriatic has appeared. It is illustrated with three double plates; and the species which have served his purposes are *Chiton siculus* and *C. laevis*. This part is devoted especially to the finer structure of the buccal muscles, of the parts surrounding the mouth and below the radula, and the minute structure of the branchia. He confirms the conclusion of Dall in 1879, — that the separate branchial tufts correspond each to a distinct branchia, instead of to the old cyclobranchiate theory, — and adds very materially to our knowledge in each of the above-mentioned directions. The author wisely refrains from much theorizing, as no group of equal rank exhibits more polymorphism than this, and no general rules can be

laid down with confidence from the examination of two species. — (*Mittheil. zool. inst. Wien*, v. heft 1.)
W. H. D. [398]

Crustaceans.

Trilobites from the Hamilton rocks of Pennsylvania. — Professor Angelo Heilprin has found in a small collection of invertebrate fossils obtained from the Hamilton rocks of the vicinity of Dingman's Ferry, Pike county, Penn., a complete specimen and several tail-pieces of *Phacops bufo*, and several well-preserved fragments of *Homalonotus Dekayi*. The determination of these species is of peculiar interest, inasmuch as it had been asserted that no trace of trilobites could be discovered in the rocks of this series. — (*Acad. nat. sc. Philad.*; meeting Oct. 30.) [399]

VERTEBRATES.

Origin of fat in cases of acute fat-formation. — The chief part of this paper by Lebedeff is taken up with a discussion of the origin of the fat formed or deposited in the liver in phosphorus-poisoning. The author criticises at length the different theories of the origin of fat, under both physiological and pathological conditions. He does not admit the generally accepted theory of Voit, that the fats of the body form one of the products of the destruction of proteids, and gives some calculations showing the insufficiency of such an hypothesis to account for the amount of fat found in the liver and other organs after poisoning by phosphorus. His own view is, that, under normal conditions, the animal fat is derived directly from that taken into the body as food, while, in pathological cases, — fatty infiltration of the liver, for instance, — the fat originates from that already stored up in the body. The change in the chemical composition of the blood, produced by phosphorus, causes the fat in the subcutaneous connective tissue to pass into the blood, whence it cannot be removed on account of the diminished supply of oxygen, which is one of the results of phosphorus-poisoning, and therefore accumulates in the liver. Lebedeff has shown in a former paper, that when a dog is starved until all fat has disappeared from its tissues, and is then fed on foreign fats — linseed-oil, for example — and some proteids, there is a large accumulation of the strange fat in the body. Similar experiments were again made, with the addition that the animal was afterwards poisoned with phosphorus. Chemical analysis of the fat of the liver in such cases showed that it also, like the subcutaneous fat, contained a large proportion of the foreign fat. This fat could not have resulted from the destruction of proteids of the body, but must have been derived from fat already stored up in the body before poisoning, especially the subcutaneous fat. Lebedeff also made chemical analyses of the fats contained in the milk of the cow, woman, and rabbit, and compared them with the fats of other parts of the body. He finds that the 'fat of milk has no analogue in the body,' and consequently is not derived directly from these fats. He does not believe, however, that this fat results from proteid metamorphosis. The increase in

the fat of milk, that takes place after feeding with meats, is owing, he thinks, to the fact that the albuminous material taken serves to emulsify the fats, and thus insures an easier passage from the blood. He comes to the conclusion that the fat of milk is directly influenced by the nature of the fat taken as food, and gives the results of some experiments demonstrating this fact. With regard to the origin of the milk-fat, his statements are not very satisfactory. It is derived directly, in the first place, from the fat of the mammary glands, with which it agrees in composition. This, in turn, is formed, he thinks, from the fats taken as food, or, in the case of starvation, from the fats stored up in the body. — (*Pflüger's archiv*, xxxi. 6.) W. H. H. [400]

Mammals.

Vaso-dilators of the lower limb. — In previous papers, Dastre and Morat have shown that the view which was generally held of the distribution of the vaso-motor nerves — that the vaso-constrictors take their course through the sympathetic, the vaso-dilators through the cerebro-spinal nerves — is not true for the cervical sympathetic. They succeeded in demonstrating in it the presence of vaso-dilator nerves for the cheek, lips, etc. In the present paper they give the results of similar investigations upon the lower segments of the sympathetic, and the vaso-motors of the lower limbs. In order to estimate the vaso-motor effects, two methods were used. A manometer, or sphygmoscope, was connected with the femoral artery below the origin of the profunda; and, at the same time, the color-changes in the skin of the toes were noticed. Young dogs with little or no pigment on the feet were used. They first investigated the effect of stimulation of the peripheral end of the divided sciatic. In all cases the manometer showed a rise of arterial pressure, indicating that vaso-constriction had taken place; but, together with this general vaso-constriction of the blood-vessels, it was found, in some cases, that the balls of the toes were congested, showing local vaso-dilatation. If, instead of the sciatic, the abdominal sympathetic was divided at the level of the fourth lumbar ganglion, and the peripheral end stimulated, the same result was reached, — a general constriction of the arteries, together with a local dilatation of the skin of the toes. The latter phenomenon, as in the first experiment, was not constant. When the sympathetic was stimulated still higher, just below the diaphragm, the manometer gave a rise of pressure; but the dilatation of the vessels of the toes was more evident, and occurred in all cases. The interpretation they give to their experiments is, that vaso-dilator as well as vaso-constrictor fibres run in the sympathetic to the lower limbs; the vaso-constrictors predominate: hence the general rise of blood-pressure in the limb. The fact that the vaso-dilator effects are always obtained when the lower part of the thoracic sympathetic is stimulated, while in stimulation of the lumbar sympathetic and the sciatic this phenomenon is very inconstant, means, they think, that the vaso-dilators terminate, in part at least, in the

ganglia of the lumbar sympathetic, and exercise their influence on the blood-vessels by means of these ganglia, and not through the hypothetical peripheral ganglia of Goltz. Facts of the same general import have been given before by the authors, with regard to the last cervical and first thoracic ganglia. — (*Arch. de physiol.*, 549, 1883.) W. H. H.

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Sexual variation of Rhytina.—Drs. Stejneger and Dybowski have given in two different journals a preliminary account of their joint discovery of a remarkable variation, supposed to be sexual, occurring in the skull of the arctic sea-cow. Their conclusions are based upon an examination of five adult male and three adult female skulls. The male skulls have the zygomatic arches both absolutely and relatively wider than the female skulls. The whole central portion of the former, also, is wider than that of the latter. In the female the vertical ramus of the mandible is longer than in the male, and the posterior angles are much nearer together. It appears that these differences have long been recognized by the Eskimo. — (*Proc. U. S. nat. mus.*, v. 79; *Proc. zool. soc. Lond.*, 1883, 72.) F. W. T.

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ANTHROPOLOGY.

The death of King M'tesa.—Col. J. A. Grant, once the guest of this renowned king of Uganda, gives credit to the report of his death, published in the daily papers of the 13th of July. Some years ago the king was suffering with a malady which the missionaries believed would terminate fatally unless an operation was performed. The king was dissuaded from this; though the Africans, as a rule, operate upon one another without fear. When Speke and Grant visited him in 1862, he was a minor, the lineal descendant of a line of thirty-five kings, which accounts for the 'blue blood' and vanity which certainly ran in the veins of M'tesa. Col. Grant alludes to the princes of Uganda, whom Stanley saw in chains, as following a custom by no means irksome, to which M'tesa himself had submitted previously to his election. The vigor with which he administered his government, and his courtesies to travellers, have given him a world-wide reputation. He raised his subjects above the ordinary scale of Africans by making them observe while travelling. He fearlessly adopted the Mahometan, and afterwards the Christian religion, by listening to the Mollahs and Christian travellers who entered his country; his previous belief having been in one supreme being and in charms. To M'tesa is greatly due the discovery of the sources of the Nile; for it was he who gave us the route from the Victoria Nyanza to Egypt, and the knowledge that we have of the people, and the flora and fauna, of equatorial Africa. The army and navy of this king is said to have numbered 125,000 soldiers. His government was carried on by daily durbars, where several hundred chiefs of districts assembled with their followers to hear the eloquence of the prime-minister and members of the government. — (*Proc. geogr. soc. Lond.*, Aug.) J. W. P.

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The tribes of the Cunéné, S. W. Africa.—

The earl of Mayo, having spent the best part of a year in Mossamedes and its vicinity, gives us the benefit of his experience. Not much new information is conveyed about Portuguese rule; but a very interesting account is given of a colony of Boers, at Humpata, who, with their wives, children, and cattle, had trekked from Pretoria in the Transvaal, and reached his place after seven years' wandering. The negro tribes encountered were: 1. The Mundombes, holding the region from Mossamedes to Capangombe, at the foot of the Sierra de Chella. They have a language of their own, and belong to the Bantu family. They are large cattle-keepers, and are the native porters who carry travellers' luggage as far as the top of the Sierra de Chella. 2. The Munhanecas and Quipongos, tribes who inhabit the country around Humpata, Huella, and three days eastward. They are of the Bantu stock, cultivate the soil, and are armed with poisoned arrows, assegais, and knobkerries. 3. The Chibiquas, who live on the west slope of the Sierra de Chella, north of the Cunéné River. They belong to the Damara race, intermixed with Ovampos, whose language they speak. They capture the elephant by prodding the hind-feet so as to sever the muscles. The animal, thus brought to a standstill, is despatched with assegais. 4. The North Ovampos, who speak a dialect of the Damara language, and cultivate each an hereditary farm, having no communal farming, as the Hahé and Huilla natives. — (*Proc. geogr. soc. Lond.*, Aug.) J. W. P.

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The Lolos of central China.—There is one indigenous tribe or people, now completely enveloped by a Chinese population, which has successfully resisted the wave of Chinese encroachment. They are termed 'Lolo' by the Chinese, 'Lo-see' and 'Ngo-see' in their own dialect. They inhabit a mountainous region on the Yangtze, between 27° and 29° north. They make incursions into Chinese territory for blackmail and ransom, which they call 'rent,' and hold in slavery the Chinese then captured. We have the word of Marco Polo that "they are a tall and very handsome people, though in complexion brown rather than white, and are good soldiers." They never intermarry with the Chinese, even the Chinese female captives being given to the male captives as wives. Mr. Baber, who has closely studied these people, seeks to identify them with the *Colomon* of Marco Polo, and in the course of his argument makes some interesting statements respecting their burial-customs. They possess the art of writing; and Major-Gen. Mesny, of the Imperial Chinese army, some years ago obtained a thick folio manuscript from a tribe near Chenning, in Kuei-chou (25° north, 105° 40' west). The work is bound in goat-skin with the hair on, and is written in the ordinary Lolo script, with illustrations of a crude and primitive nature, depicting human figures, animals, and plants. Mr. Baber pays a just tribute to Baron v. Richthofen and Col. Yule, in stating his conclusions respecting the Lolos. — (*Proc. geogr. soc. Lond.*, Aug.) J. W. P.

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Ethnology of Timor.—In a letter addressed to Sir Joseph Hooker, in 1880, Mr. H. O. Forbes wrote

from Sumatra, offering, if some assistance could be forwarded him, to attempt an expedition to Timor-laut. The British association granted the needed funds, and the trip was made. This island must not be confounded with Timor, lying to the south-west. A large collection of crania and culture-objects was made, and a vocabulary of several hundred words compiled. Among their customs described are their methods of dressing the hair, the clothing and ornamentation of the body, their agriculture, meals, fishing, armor, marriage, care of children, mourning, inheritance, oaths, government, slavery, physical characteristics, intellectual and moral qualities, pastimes, music, and calendars. Commenting on the paper, Prof. Flower stated, that, of the twelve crania, eight were brachycephalic, and of decidedly Malay type; one was dolichocephalic, prognathous, and with large teeth, indicating Papuan or Melanesian affinities; and the other three were more or less intermediate. Nearly all showed signs of artificial flattening of the occipital region.

Mr. Keane remarked that Mr. Forbes confirmed the prevalent opinion regarding the extremely complex nature of the ethnical relations throughout the whole of Malaysia and Polynesia. In Timor-laut, Papuan, Malayan, and even Polynesian tribes had here become intermingled in diverse proportions; the result being a distinctly mixed race, such as was everywhere in this region often designated by the inconvenient term of 'Alfuro.' Timor-laut, however, seemed to present the peculiarity that the various elements had not here become so completely amalgamated as in most of the neighboring islands. Hence the remarkable phenomenon of frizzly and lank hair, brown and black complexion, very tall and very short stature, dolichocephalous and brachycephalous heads, etc., all still found side by side in the same village community. The resemblance in so many of the crania to those of the brown Polynesian race of Samoa, Tahiti, Hawaii, etc., was very striking; so that Timor-laut must have been one of the last islands occupied by this race in Malaysia during its eastward migration to the remote archipelagoes of the Pacific.—(*Journ. anthrop. inst.*, xiii. 8.) J. W. P.

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The Mavia tribe of negroes.—Cape Delgado is on the east coast of Africa, about 11° south. Mr. H. O'Neill, H.M. consul, has made a journey inland from this point into the country of the Mavias, or Mahibas, whose existence was first pointed out by Livingstone, and who have baffled the efforts of succeeding travellers to penetrate their country. Mr. Joseph Thomson and Mr. Chauncey Maples both testify to their exclusiveness. A description of one village will serve for all. A circular belt sixty to eighty feet wide was thickly planted with trees and underbrush. At two or three points a narrow path was left for entrance, and guarded by double or triple gates. The gate is a framework of two strong uprights, deeply embedded in the ground, and strengthened by two horizontal bars about five feet apart. Two other movable horizontal bars fit, one end in a hole, the other in a niche in the uprights. A number of smaller up-

rights have holes burnt through both their ends, by which they are threaded upon the two horizontal bars until the framework is completely closed, when the ends are thrust into the holes and niches, and the whole strengthened by beams placed against it on the inside. The gates are carefully closed at sunset. Forty or fifty huts are built in the space, and goats and poultry take the place of the Irishman's pig in each shanty. This tribe wear immense lip rings or studs, which give to them a hideous profile. They show a great respect for the dead, and carefully tend the graves of any of their chiefs or head men. On some of these are raised mounds of clay, enclosed with a low ridge. This again had a raised framework upon it, roofed in with thatch, and the corner posts ornamented with small streamers of cloth. Mr. O'Neill appends a vocabulary of about a hundred words.—(*Proc. geogr. soc. Lond.*, July.) J. W. P.

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EARLY INSTITUTIONS.

French and English law.—Some time ago the Institute of France proposed as a subject for competitive writing a comparison of the French and English systems of law in their history and development. An extensive work (5 vols. 8°) was forthwith produced by M. Glasson. It was accepted and 'crowned' by the academy. It is entitled *Histoire du droit et des institutions politiques, civiles, et judiciaires de l'Angleterre, comparés au droit et aux institutions de la France, depuis leur origine jusqu'à nos jours*. The book is being reviewed, and is much praised. The student who finds Reeves' History of the English law obsolete and tiresome will be glad to have a substitute for it. The writer takes up different subjects,—'the king,' 'parliament,' 'property,' etc.,—and treats them separately. The sequence of events, and their relationship with one another, are by this method lost sight of to a certain extent. The method has its advantages, however; and a subject so comprehensive could hardly be treated, we should think, in any other way. It is quite impossible to bring history, with its innumerable beginnings and endings, or issues, into one continuous narrative. French history begins with the meeting of the Germans and the Romans. French institutions are, to begin with, partly German, partly Roman. English institutions are, however, almost purely German down to the period of the Norman conquest. It is in England, therefore, that we trace the development of German institutions, rather than in France. The monarchy, for example, was in France framed upon the Roman model; while in England the Teutonic model was adhered to. While we have an absolute monarchy in France, we have a very limited monarchy in England,—a democratic republic, with a monarchical head, so to speak. Feudalism is described as the result of German and Roman influences. It established itself in France, and was taken from France into England. The English were verging towards feudalism, to be sure. There was a good deal of feudalism in England before the conquest. The custom of commendation was not unknown, but it was not associated with the holding of benefices. The hold-

ing of *boc-land* under the *trinoda necessitas* resembled the holding of a benefice in later times; but the holders of *boc-land* were not vassals of a lord. Their services were due to the state rather than to the king. The king was not the universal landlord until after the conquest, when the Norman lawyers persisted in describing proprietorship as a tenancy. At the same time a great deal of proprietorship was converted into tenancy. The position of the isolated proprietor was unsafe; and proprietors very generally converted their inheritances into tenures, under the overlordship of the king or some other great lord. M. Glasson describes the various forms of tenure which existed under the feudal system, and the condition of the tenants. A large part of the work is devoted to legal procedure and judicial organization. — (*Edinburgh rev.*, July, 1883.) D. W. R. [408]

NOTES AND NEWS.

THE death of Dr. John L. LeConte at his home in Philadelphia on Thursday of last week, at the age of fifty-eight, removes one who has long been the leader, *facile princeps*, of American entomologists. With his death, the younger men are completely separated from the former generation of workers in this field, and they will lose a friend and teacher to whom they constantly looked. Dr. LeConte was as highly honored abroad as at home, and has been an active investigator for nearly forty years. His death occurred during the session of the National academy, of which he was a member, but was not known in New Haven until its close. We shall give in a future number an account of his services to science.

— President Arthur, in carrying out an act passed by Congress, has invited the various countries to send representatives to an International conference at Washington, the date of which is not yet fixed, to establish a common prime meridian. The governments of Austria, Norway, and Sweden, have declined; but the latter two approve of the object. Spain is favorable, but has deferred its reply. Belgium is uncertain, but Denmark and Portugal have accepted the invitation conditionally. Switzerland, Venezuela, Mexico, Turkey, Greece, China, Japan, Hawaii, Hayti, Liberia, Holland, Canada, Guatemala, Roumania, Nicaragua, and Honduras have accepted. Replies are expected from Italy, Great Britain, Russia, France, Chili, Brazil, and Germany.

— Mr. Edward Atkinson has prepared a plan for a textile laboratory and museum in Boston. He thinks that a hundred thousand dollars would be ample for the construction of a proper building, and its equipment, which should be an adjunct of the Massachusetts institute of technology. The purpose is to afford special training for young men intending to pursue textile manufacture. The first two years' course of instruction in the institute is suited as a basis for the future special study of textile manufactures; and it is in the next two years of the curriculum that special training should be followed. The first two years would ground the student in modern languages and mathematics, in mechanical drawing, in general

geology and chemistry, as well as in the practical work of the physical and chemical laboratories, and will thus prepare him for entering upon the special course of textile industry. The professional studies would include geology, botany, mechanical engineering, building and architecture, mechanics, textile design in all branches, industrial chemistry, history, and political economy.

— Professor Balfour Stewart and Mr. W. L. Carpenter discussed, before the British Association for the advancement of science, the supposed sun-spot inequalities of short period. Putting aside for the time the question of true or nearly apparent periodicity, they exhibited certain results obtained by application of a method of detecting unknown inequalities in a mass of observations. Thirty-six years' observations of sun-spots were divided into three series of twelve years each. Two apparent sun-spot inequalities of about twenty-six days came out very prominently, appearing for each of the twelve years in the same phase, and to very nearly the same extent.

— A design for a new high-level bridge at Newcastle-on-Tyne has been prepared by W. G. Laws, city engineer. It shows a clear span of six hundred feet, and a clear headway above high water of eighty-two feet. The bridge will be of steel, and the cost of superstructure, foundations, and approaches, is estimated at two hundred and fifty thousand pounds.

— Sir J. Whitworth & Co. have lately completed and tested a 9-inch (23 centimetres) gun for the Brazilian government. The peculiar feature of this system is the hexagonal section of the bore of the gun. The material is compressed cast steel, which is superior to other steels in its combined ductility and tenacity, and in its perfect soundness. This gun, on trial, threw a shell of the weight of 300 pounds (136 kilograms) 7,876 yards (over 7,000 metres), and drove a steel shell weighing 400 pounds (181 kilograms) through a wrought-iron plate 18 inches (48 centimetres) in thickness; and its backing broke up a cast-iron plate supporting it, and finally buried itself in the earth. Such results are not attainable, so far as experience has yet indicated, by any other system of ordnance.

— An electric tram-car was recently tried in Paris very successfully. It was driven a distance of thirty miles in about three hours without accident or detention. The current was supplied by Faure accumulators placed under the seats, and driving a Siemens dynamo under the floor at the rate of twelve hundred revolutions per minute. The car-wheels turn sixty times to twelve thousand revolutions of the dynamo. The speed attained was five and a half to nine miles an hour, according to the gradient.

— In a paper before the British association, Professor Boyd Dawkins remarked that the classification of the tertiary rocks, sketched out some fifty years ago, and since then altered in no important degree, is out of harmony with our present knowledge, and the definitions of the series of events which took place in it has been greatly modified by the process of discovery in various parts of the world. The terms 'eocene,' 'miocene,' and 'pliocene' no longer express the

idea of percentages of living species of fossil mollusca upon which they were founded; and post-tertiary, quaternary, and recent are founded on the assumed existence of a great break comparable to that separating the secondary from the primary or tertiary periods, which is now known not to exist. The author proposed a classification of the tertiary period in Europe by an appeal to the land mammalia, and since that time his definition has been found to apply equally well to the tertiaries of Asia and the Americas and to the late tertiaries of Australia. He stated that the forms of life in the rocks have changed at a very variable rate, and in direct proportion to their complexity of organization; the lower and simpler having an enormous range, while the higher and more complex have a much narrower range, and are more easily affected by the change in their environment.

—The proposed discussion on the possibility of establishing a universal time by selecting a meridian common to all nations has given rise to many suggestions more or less valuable. One of these, published in the *Journal of the society of arts*, is, that 'the simplest way of expressing this universal time would be by using Roman figures; while the civil time would be expressed by Arabic numerals, followed by a large *H* for the morning hours, and a small one for those of the evening. In fact, the hour would be expressed in a manner similar to that in use among the Russians for designating the old and new style in dates. In the same manner as they say 16/28 June, the railway time-tables would say, Arrival at Paris, XXIII./10 h. 24 m.; departure from Paris, XVI. 40 m./4 h. 04 m.; departure from St. Petersburg, VIII. 10 m./9 H. 26 m.

—At the meeting of the French academy of sciences, held Oct. 3, M. Alphonse Milne-Edwards reported the foundation of a new laboratory of marine zoölogy at Marseilles. It is to be under the direction of Professor Marion, of the Marseilles faculty of sciences.

—The periodicity of drought and floods in the Rhine district, and its connection with sun-spots, auroræ, and the magnetism of the earth, is dealt with in a work by Professor Paul Reis of Maintz, just published by Messrs. Quandt and Handel of Leipzig. The volume is entitled 'Die periodische wiederkehr von wassersnoth und wassermangel.'

—In Austria, as well as in Germany and England, systematic efforts are being made to settle the questions as to the contagiousness and heredity of tuberculosis. A circular has been sent to eight thousand medical men in Austria, requesting them to give particulars of any cases which they consider to have proved the contagiousness of the disease, and also to give the particulars of cases of supposed heredity, and of any cases in which complete cure is believed to have been effected. The determined international effort which is being made to cope with this fell disease must be regarded as one of the results of Koch's discovery of the *Bacillus tuberculosis*.

—At a recent meeting of the French entomological society, Dr. Laboulbène instanced a case in which

dipterous larvae had been vomited by a woman thirty-nine years old, under the care of Dr. E. Pichat of La Rochelle. Specimens of the pupa, and of the fly hatched from them (*Curtoneura stabulans* Fall.), were exhibited to the society. The woman had been troubled for some days with bronchitis and very fetid breath, and finally, after a severe attack of coughing, vomited twice. Dr. Pichat afterward found in the basin used a hundred to a hundred and fifty of these larvae; and the circumstances as related by him leave no serious doubt of their source, though he was not present during the vomiting, but only called immediately after it.

This larva, according to Laboulbène, is well known, and is ordinarily found in decomposing animal and vegetable matter, in mushrooms, etc., and has also been reared from caterpillars and hymenopterous larvae.

The possibility of the existence of such flies (*Muscariæ*) in the human body was formerly generally accepted, but has lately been denied by Davaine. Experiments have proved, says Dr. Laboulbène, that such larvae, introduced into the stomach of animals by a fistula, have been discharged alive in the excrement, one, two, or even three days later.

—At the meeting of the Engineers' club of Philadelphia, Nov. 3, Mr. Charles H. Haswell presented 'Notes upon roads, streets, and pavements;' Mr. E. A. Geiseler read an illustrated paper upon 'Tides, and Newton's theory of them;' Mr. Allen J. Fuller spoke of the 'Effect of frost upon fire-plug casings,'—a paper which will be noticed next week under the 'summary.' Professor Haupt also exhibited a 'History of the manual arts, or the inventions of human wit,' published by Mr. Herringman, London, 1661. The secretary read the following account from the *Mexican national* of Laredo, Tex., of a bridge construction by Mr. C. A. Merriam: "On the sixth day of September (the anniversary of loss of bridge last year) the Mexican national railroad-bridge was carried away by high water. On Monday the 16th the first pile was driven for the new structure, which was completed on the 23d; and trains are now running regularly. This is pretty quick work,—the erection of a bridge six hundred feet long in seven days."

The secretary narrated his experience on behalf of the club, and read extracts from correspondence, etc., with the custom-house, through the stupendous inscrutability of the management of which the Transactions of the society of engineers of London, and of the Institution of civil engineers of Ireland, are charged with duty; and all the other foreign societies upon the exchange list of the club are admitted free.

—*Scandinavia*, published in Chicago, is the title of a journal devoted to the interests of Scandinavian life, past and present. It is printed in English, and is intended to keep the American public informed as to the movements, both in politics and literature, among the people of Denmark, Sweden, and Norway. The first number is dated November, 1883.

—Lindström has published in the *Bihang* to the Swedish academy's *Handlingar* an annotated index to the generic names applied to the corals of the

paleozoic formations. A list, by Dalla Torre, of the generic names given to Hymenoptera during the decade 1869-79, appeared in Katter's *Entomologische nachrichten* of last December.

—The *Humoristické listy* of Prag for Oct. 27 contains an excellent large portrait of the late Mr. Barande. We shall publish one next week.

—The mathematical magazine conducted under the name of the *Analyst* for the past ten years, by Mr. J. E. Hendricks, will be continued under the editorial charge of Ormond Stone, professor of astronomy, and William M. Thornton, professor of engineering, with the title, *Annals of mathematics, pure and applied*. The numbers will be issued at intervals of two months, beginning Feb. 1, 1884. In scope the journal will embrace the development of new and important theories of mathematics, pure and applied; the solution of useful and interesting problems; the history and bibliography of various branches of mathematics; and critical examinations and reviews of important treatises and text-books on mathematical subjects. The office of publication will be at the University of Virginia.

—Dr. Macgowan recently sent a communication to the *North China herald* on the art of making luminous paint in the celestial empire. The Chinese, says Dr. Macgowan, used powdered mussel-shells instead of oyster-shells. The method seems to be ancient. The emperor, Tai Tsung, who flourished towards the end of the tenth century of the Christian era, received a picture which was luminous by night. The picture represented, by night, a cow lying within a fence; while, by day, the cow appeared as browsing outside of the enclosure. His Majesty asked for an explanation from his ministers, but they were no better informed than he. At length some one informed the emperor that the effect was produced by mixing Southern-Sea pearl-paste with a pigment which at night became luminous, and that the day-picture was made of a powdered reef-stone. In after-ages the picture was attributed to the genii, whilst some denied its existence altogether. Dr. Macgowan shows, by extracts from a Chinese writer of three centuries ago, that the tradition of the art had not died out.

—The meeting of the Philosophical society of Washington, held Nov. 10, was devoted to the consideration of geologic subjects. Mr. Edwin Smith exhibited a seismographic record obtained in Japan, and described the system of observations conducted by Professor Paul. Capt. C. E. Dutton read a paper entitled 'The volcanic problem stated,' and Mr. W. J. McGee made a communication on the 'Drainage system, and the distribution of loess, in eastern Iowa.'

—John T. Short, professor of history at the Ohio State university at Columbus, died Dec. 11, after a long illness. He was especially well known for his researches in the history of Central America. His 'North-Americans, and their early history,' passed through many editions.

—The papers read at the meeting of the Biological society of Washington, Nov. 16, were by Professor Lester F. Ward, Mesozoic dicotyledons; Mr. C. D. Walcott, Fresh-water shells from the lower carbonif-

erous, with exhibition of specimens; Mr. Frederick W. True, Exhibition of a unique specimen of a West-Indian seal, *Monachus tropicalis* Gray; Dr. C. A. White, Persistence of the domestic instinct in the cat.

—An unpretending but useful little paper has been lately published as Bulletin no. 5 of the Illinois state laboratory of natural history, by N. S. Davis, jun., and Frank L. Rice. This paper contains concise descriptions of seventy-four species and sub-species of North-American batrachians, and fifty-four of reptiles, found east of the Mississippi. Analytical keys to the families and genera are given, but no synonymy. The classification and nomenclature are those of Professor Cope's Check-list, and the descriptions are in great part compiled from writings of the same author. There is, however, evidence of considerable study of specimens; and the collector of reptiles in the region covered will find this catalogue very convenient.

—A boy fourteen years of age was fishing at Tomioka, Nizen, Japan, recently, when his right arm was seized by a large octopus with two of its tentacles. His cries brought succor as he was being dragged into the water, and the tentacles were cut. The lad reached home; but his arm seemed paralyzed, and in five days death ensued, probably from shock.

—H. Schällibaum recommends a mixture of one volume of collodion with three to four volumes of oil of cloves, to secure microscopic sections in place upon the slide. The oil is evaporated over a water-bath, after which the sections may be stained, etc. An advantage is thus offered over Giesbrecht's shellac method. The full directions are given in the *Archiv für mikroskopische anatomie* (xxii. 689).

—Four mummies have been obtained from the Aleutian region for the Berlin museum. They are in a good state of preservation, and are believed to be of great age.

—M. A. Dumont has submitted to the Paris academy of sciences a suggestion for increasing the irrigating waters derived from the Rhone by regulating the discharge from the Lake of Geneva. This project, recommended by the Geneva commission, involves the expenditure of about £180,000, and the creation of a hydraulic force of 7,000-horse power, by which the level of the lake at high water might be reduced by at least 0.60 m., and the minimum discharge of the Rhone at the outlet increased by 80 mc. per second.

—The science of forestry has hitherto been much neglected in England: but the *Athenæum* states that the proposal to hold an International forestry exhibition in Edinburgh during the summer and autumn of next year has been taken up with much earnestness; and the sum of £3,500 has already been obtained as a guaranty fund, without any direct appeal to the public at large. Besides specimens of forest produce, implements used in forestry, fungi, rustic work, etc., there will be a collection of illustrations of trees, scenery, forest labor, and the like, along with books, maps, and reports bearing on forest history, surveys, and the geographical distribution of trees.